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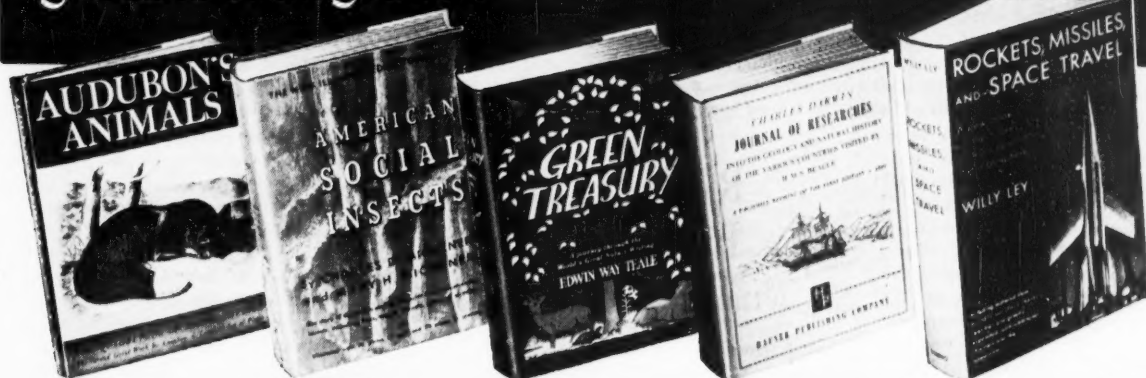
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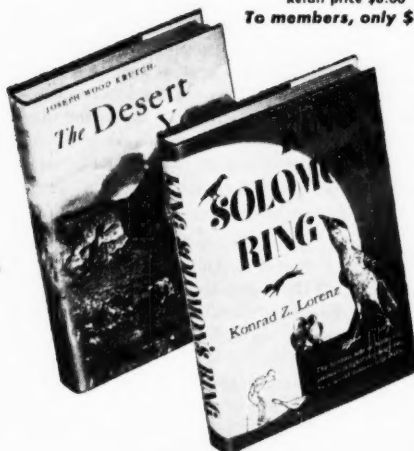
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Nature in Print

By HOWARD ZAHNISER

AS CITIES grow and daily life becomes of necessity more and more mechanized, we inevitably come to have less to do with, even to see less often and to be less aware of, other things which live; and it comes to seem almost as though all the world outside ourselves were inanimate," Joseph Wood Krutch points out in his recent volume *The Beat of Two Worlds*. And he points it out with a sense of caution. Our urban civilization he values, but within it he still cherishes highly the opportunities for awareness of the natural world. "We are really a new breed," he says, with a new kind of sensibility. He quotes Thoreau—"I walk as one possessing the advantages of human culture, fresh from the society of men, but turned loose into the woods"—and comments, "His was the best of two worlds," a comment which indeed gives the title to his work. It is a charming, thoughtful volume, dealing, as its jacket note says, with "the New England world of changing seasons: the long, quiet days of winter; the churning awakening of spring; the steady growth of summer; and the colorful retreat of autumn." There is in its reading the same pleasure and sense of enrichment that come with a trip into the country, when the trip is made with one who not only points but ponders. For Professor Krutch is a philosopher who thinks profoundly as well as engagingly and insists calmly that we must remember our nature and our relation to all Nature.

The same truth that Professor Krutch thus urbanely contemplates John H. Storer teaches in scientific detail in his "study of the interrelationships of living things," which he has entitled *The Web of Life: A First Book of Ecology*. "The most basic truth regarding our Earth-home," writes Fairfield Osborn, in its introduction, "is that all living things, in some manner, are related to each other," a fact that "while mainly important as a physical principle," he says also "carries implications even of a spiritual nature." The author himself says that "this book is written for everyone interested in the wise use of our soil and water, our forests and wildlife, and for everyone who would learn what has largely been forgotten in our machine age—how all living things fit together into a single pattern." It is written simply, interestingly, and impressively.

After a first chapter that looks on life as "a flowing stream, forever passing away and as constantly being renewed" with an energy "supplied from many different sources, most of them beyond our vision or experience," Mr. Storer carries us through an introductory course in ecology that is well indicated in its chapter titles: What the Rocks Contribute, How the Land Gets Its Water, Life Prepares Its Own Environment, Life Comes to the Soil, The Soil Responds, The Forest Grows, The Forest Community, The Community Through the Seasons, Community Life Cycles, Life Zones, A Strand of the Web Breaks (a consideration of bark-beetle damage in the White River National Forest of Colorado that followed a storm blowdown which buried the underside of spruce trees and hid the bark beetles beyond the reach of arctic three-toed woodpeckers), The Grassland Community, Some Laws of Life, Arteries of Life, Land and Water

Meet, The Pacific Salmon, The Evolution of Life, Human Intelligence, and Man in the Web.

"One basic fact!" Mr. Storer emphasizes again and again, "that the surface of the earth is a highly complex living organism. It can be harnessed and made very productive if it is properly treated or, like the goose in the fable, it can be opened up and all the golden eggs removed." Summarizing his "story of the web of life" he makes five points that deal with:

- (1) "the endless ramifications of the environment that surrounds every living thing,"
- (2) "the teamwork and delicate balance existing between the different forces that keep life functioning on this planet,"
- (3) "the constant progression of life," one form, one community preparing the way for the next,
- (4) the power of the human intellect, and finally
- (5) the question whether, with all the triumph of his intellect, man "can coordinate knowledge into understanding and build within his heart the incentives and the wisdom to use these new-

found powers wisely, and with responsibility, for the common good."

Writes Mr. Storer most impressively:

"With the development of human intellect, the evolution of life on this planet appears to have reached a turning point. In the past, all forms of life were subject to automatic natural controls. No species could succeed or multiply beyond a certain point without encountering controls that would eventually put it back in its proper place or even eliminate it, and the great stream of the world's life would go on undisturbed.

"Today this condition has been changed. Through the use of his intellect, man has partially escaped from the controls of nature. He has achieved almost unlimited power to multiply his numbers and at the same time to destroy the world's resources that might have supported him. Under the domination of his

intellect, the world's life, and the environment of that life, seem to have reached a crossroads, and the choice of direction is for the future to decide."

The basis of the evolution that has developed man and this triumph of his intellect, N. J. Berrill strikingly shows in another new book, is sex, and with all the fascination of the subject and his own skill in exposition, Professor Berrill writes, as the book's jacket note puts it, of "what the barnacle has in common with the bird, the jellyfish with the fern, the lizard with the woman, the man with the maid." This volume, entitled *Sex and the Nature of Things*, is like John H. Storer's a study of the nature of our interrelated existence with all of life. As Professor Berrill says:

"We are using our minds to explore our beginnings, delving into heredity and hormones and history to the limit of our ingenuity, trying to find our future pathway by tracing the way we have come—and writing books about it all, sex especially.

"Yet out of sex cells," he continues, "came evolution; from sex hormones came the sexes and a certain mutual bondage; from milk came maternity and the concern of parenthood in general; climbing a tree brought color, a hand, and a mind; and something of a voice; and on descending, we find ourselves endowed with a mixture of unwanted heritage and the beginnings of spiritual grace. We start with life and sex, we are left with love and a mind with an eye for beauty."

Reflections of Farmer Amos

By WILLIAM ARNETTE WOFFORD

When Farmer Amos, almost eighty-three,
Reflects on death, he says: "I have no fear
Now that my time of going is so near.
To tell the truth, I'm curious to see
Just what it's like; for when I've ploughed my land
And followed furrows as the dark loam curled,
I've felt such kinship with the pulsing world
I've touched the cool, rich soil with my bare hand.

"Besides, why should a planter who has seen
Grain kernels burst, when freshened by the rain,
Know fear or dread? Why, dying is no pain;
A seed must die to come up young and green.
And sure as fields lie fertile under snow,
The life in me will live. This much I know."

"Where we go from here," Professor Berrill says he does not know, but certainly like Mr. Storer he would see our onward journey as with the stream of life, which moves with the impulse of sex, and he would emphasize the importance of our awareness of this mighty stream of life. It is this suffusion of his book with the air of life importance that brings it into this triangle with John H. Storer's and Joseph Wood Krutch's, "Today the grandest of all disputes," as Professor Krutch views our world, our two worlds, "is that between those who are determined to manipulate man as though he were a machine and those who hope, on the contrary, to let him grow like an organism. Whether our future is to be totalitarian or free depends entirely upon which side wins the dispute, and the question which side we ourselves are on may in the end depend upon our conception of 'man's place in nature.'"

These books all develop the concept of our human interrelations with all of life, and there is no doubt regarding which side of Professor Krutch's grand dispute they all support.

Sex and the Nature of Things. By N. J. Berrill. New York: Dodd, Mead & Co. 1953. xiii + 256 pp. (5¾ by 8½ in.) with 44 drawings by the author, book list, and index. \$3.50.

The Best of Two Worlds. By Joseph Wood Krutch. New York: William Sloane Associates. 1953. 171 pp. (5½ by 8½ in.) with 11 drawings by Walter Ferro. \$3.

The Web of Life: A First Book of Ecology. By John H. Storer. New York: The Devin-Adair Co. 1953. 144 pp. (5¾ by 8½ in.) with introduction by Fairfield Osborn, 48 photographs in center section which with their captions "may be studied as a separate section," and bibliography. \$3.

Alaskan Wildlife

Wildlife in Alaska. By A. Starker Leopold and F. Fraser Darling. New York. 1953. The Ronald Press Company. 129 pages. \$2.75.

The subtitle given this interesting and valuable little book is "An Ecological Reconnaissance." It is the result of a study of the great horned mammals of Alaska sponsored by The New York Zoological Society and The Conservation Foundation. The study was made by a distinguished team—Starker Leopold from the University of California, and Fraser Darling from the University of Edinburgh. Speaking generally about the wildlife situation in the Territory of Alaska, the authors urge that a policy of wildlife conservation should precede the penetration of the country by man and his development of it. Wildlife is discussed in its relation to other resources and to the native population, and special chapters are devoted to the status of the caribou, moose and reindeer, with other big game species considered collectively.

Cruikshank's Guide

Pocket Guide to the Birds. By Allan D. Cruikshank. New York. 1953. Dodd, Mead and Company. 216 pages. With 72 natural color photographs by Helen G. Cruikshank, and 78 drawings by Don Eckelberry. \$2.95.

As a leader of Audubon bird walks, lecturer and practicing ornithologist, Allan Cruikshank has "experimented" on his fellow walkers and his audiences in an endeavor to discover the most effective ways of making bird identification both interesting and easy for the beginner. This book is, then, based upon the convictions at which he has arrived. He has directed his book primarily to the beginner, to those who can lay no claim to being experts, and to those whose responsibility it is to introduce the layman to the pleasures of bird study and identification. The author regards it as a sort of undergraduate book for those who strive to graduate to Peterson's *A Field Guide to the Birds*. Mrs. Cruikshank's splendid color pictures, and Don Eckelberry's careful line drawings, complement each other and the text to make a well-rounded book that should achieve a cordial welcome in those ranks to which the author has addressed himself.

Birds in the Garden

Songbirds in Your Garden. By John K. Terres. New York. 1953. Thomas Y. Crowell Company. 274 pages. Illustrated. Introduction by Edwin Way Teale. \$3.95.

If you have a back yard or garden, small or large, and would like to have birds around and to come to know them, this is the book for you. It is an interesting blend of practical information on attracting birds and of personal pleasure in association with them. Mr. Terres covers bird feeding in connection with attracting them, bird houses, aid to birds at nesting time, bird baths, care and feeding of young birds, hummingbirds and how to attract them, ornamental plantings of value to birds, sounds that attract birds and some problems and how to solve them. The author seems to have overlooked nothing that would make the host to the birds a most successful and hospitable individual.

Build Your Fish Pond

Homemade Fishing. By Verne E. Davison. Harrisburg, Pa. 1953. The Stackpole Company. 205 pages. Illustrated. \$4.50.

Responsive to the recommendations of the U. S. Soil Conservation Service, thousands of farm and private fish ponds have been built and stocked with fishes. Success has not always attended such efforts. In the future, however, failures should be fewer if the pond builder has this excellent practical book at hand. It is a complete guide to the created fish pond, where to put it, how to build it, what to put in it and what you can expect from it.

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IN THIS ISSUE

February, 1954

Vol. 47, No. 2

Nature in Print	Howard Zahniser	58
Reflections of Farmer Amos (Poem)	William Arnette Wofford	58
Contents Noted	R. W. W.	63
Gorillas Are] Funny People	Herman Reuter	65
Chipmunk Action (Poem)	Daniel Smythe	68
The Tree that "Hates You"	Frank W. Lovering	69
"Old 1844", The Hope Valley Turtle	James A. Oliver	71
The Morgan Horse	Hope Satterthwaite Jex	75
Let's Take A Walk	Carsten Ahrens	78
Dry Ice Does the Trick	Peter C. Crolus	79
The Female Is Deadlier (Poem)	Eleanor Graham Vance	80
Leadplant	Ralph J. Donahue	80
Birds of Spine and Thorn	John Lindsey Blackford	81
Frogs of the Tree Tops	C. J. Stine	84
Mounting Butterflies	Woody Williams	86
Conference on Resources for the Future (Editorial)		89
John Cassin	W. L. McAtee	90
We Build Bird Houses	Thad A. Bukowski	91
The Clouds Are Nice Today (Poem)	Louise Mayers Meredith	93
World's Largest Seed	Hugo H. Schroder	93
Cousins of the Pineapple	Louis O. Williams	94
Wonder (Poem)	Elizabeth Phillips Jones	96
Montana's Marching Mountains	Paul Shepard, Jr.	97
Could They Be Tears? (Poem)	Helen Ward Gall	99
Planets as Morning or Evening Stars	Isabel M. Lewis	100
Polaris (Poem)	William James Sheppard	101
The School Page	E. Laurence Palmer	102
Camera Trails	Edna Hoffman Evans	104
Under the Microscope	Julian D. Corrington	110

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Watersheds

Vegetation and Watershed Management. By E. A. Colman. New York, 1953. The Ronald Press Company. 412 pages. Illustrated. \$7.00.

This book is the result of a study and appraisal of vegetation management in relation to water supply, flood control, and soil erosion. The study was initiated and sponsored by The Conservation Foundation. One of the most important products of the land—in many ways the most important—is water, the lack or abundance of which are limiting factors in the activities of man. The author reviews existing knowledge of the relationship between vegetation management on watersheds to the yield of water of these watersheds. It thus becomes a basic text for water supply engineers, reclamation specialists, foresters, hydrologists, soil scientists, and anyone concerned with the maintenance and development of our water resources.

Central American Birds

Life Histories of Central American Birds. By Alexander F. Skutch. Los Angeles, 1953. Cooper Ornithological Society, University of California, Los Angeles 24. 450 pages. Illustrated by Don R. Eckelberry. Paper, \$9.00; buckram, \$10.00.

Review copies not being available, we

can only report the announcement of this book by this distinguished ornithologist. The volume contains life histories of forty species of birds of Central America belonging to the higher families of song birds—the finches, tanagers, troupials, wood warblers and honey creepers. "The accounts," the announcement states, "are the work of a skilled, sensitive and patient naturalist who has devoted a quarter of a century of outdoor work to the intensive study of the varied and complex bird life of the mountains and lowlands of Latin America. All but two of the accounts are heretofore unpublished and for each of the five families a summary and a comparison of the highlights of the breeding biology of the species are given."

Chesapeake Poems

Chesapeake Cove. By Gilbert Byron. Easton, Md. 1953. The Easton Publishing Company. 57 pages. \$2.00.

A cove on Chesapeake Bay, in a country of watermen, provides the inspiration for this interesting collection of poems by Mr. Byron, a native of, and long-time dweller on, Maryland's Eastern Shore. They are delightful poems, catching the color and romance of this distinctive region and reflecting the poet's keen observation and deep knowledge of the people, places and things of this Chesapeake country.

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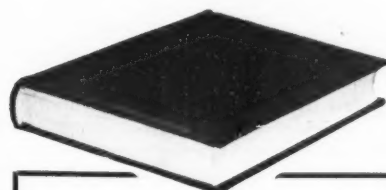
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Mention NATURE MAGAZINE when answering advertisements

The Comstocks

The Comstocks of Cornell: John Henry Comstock and Anna Botsford Comstock. An Autobiography by Anna Botsford Comstock; edited by Glenn W. Herrick and Ruby Green Smith. Ithaca, New York. 1953. Comstock Publishing Associates. 286 pages. \$4.50.

During a busy life that was devoted to natural history, nature education and Cornell University, Anna Botsford Comstock wrote this account of the lives of her husband and herself. She had intended to publish this autobiography during her lifetime, but she passed away before this could be accomplished. It remained, therefore, the task of her cousin, Professor Herrick, to see this charming and valuable publication from manuscript to the finished book, with the Comstock "trademark" of the orb spider's web in the lower right corner of the cover. In this task he was aided by Dr. Smith, who was devoted to the Comstocks, and is indebted to Dr. Francis Wormuth, who contributed a more objective view of the manuscript and suggestions for the arrangement of the book. The result is a most happy collaboration.

Mrs. Comstock's story of her husband's boyhood and early life, culminating with his years at Cornell and his graduation in 1869, provide three beautifully written and enthralling chapters. We had not before realized the hardships that John Henry Comstock endured, the happiness he found in a foster home, the summers as a cook on Great Lakes vessels, or the virtual happenstance of coming across a book that turned his thoughts from law and medicine to entomology. Mrs. Comstock's own girlhood and years as a student at Cornell are equally well told, and the first five chapters of the book draw such a vivid picture of two great personalities that they provide a perfect canvas for the picture of their full lives together.

The sixth chapter is devoted to Mr. Comstock's two years of service in Washington as United States Entomologist and sheds interesting light on the birth of economic entomology on a Federal level. From then on the book is a recounting of lives overflowing with activity and contribution to humanity, with several trips to California for work at Stanford with their close friend, David Starr Jordan, with trips abroad, and, finally, with a busy retirement. We felt that Mrs. Comstock, or the editors, gave us perhaps too little about the birth and the early days of the Nature Study movement, of which Mrs. Comstock was the "mother."

In the interests of accuracy, we must comment on a reference to *Nature Magazine*. Mrs. Comstock wrote that, in September, 1923, Arthur Newton Pack proposed that the *Nature Study Review*, which she edited, be merged with *Nature Magazine*, to which she agreed, after polling the Council of the American Nature Study Society. She then accused *Nature Magazine* of not carrying out its agreement as

of December, 1923. As a matter of fact, the *Nature Study Review* continued to appear in *Nature Magazine*, under the editorship of Mrs. Comstock, until July, 1925. After that it appeared under the joint editorship of Dr. E. Laurence Palmer and Mrs. Comstock, until the latter, burdened with the care of Mr. Comstock during the four years of his last illness, was unable to carry on. However, The American Nature Association and *Nature Magazine* have endeavored to carry forward, and to further, Mrs. Comstock's aims and ideals, with Dr. Palmer serving down to this very date as director of Nature Education of both association and magazine.

We found this biography-autobiography thoroughly fascinating for its charm, its historical picture of the early days of Cornell, for its description of people known and loved, and for its invaluable record of an important era in natural history education. R.W.W.

Rocks and Minerals

A Field Guide to Rocks and Minerals. By Frederick H. Pough. Boston. 1953. Houghton Mifflin Company. 333 pages. Illustrated with 254 photographs, 72 in full color. \$3.75.

This is the latest addition to "The Peterson Field Guide Series" under the editorship of Roger Tory Peterson. It will be widely welcomed by students of rocks and minerals and by the growing army of "rockhounds." This guide is world-wide in its application and follows the fine, practical approach to identification that has been employed in the other books in this splendid series. The author has specially emphasized identification in the field, although also providing data on other procedures employed in the laboratory. This is the pocket field guide that has been long needed and is a book that will be certain to please a large audience.

Films

Two new nature films are announced by Films of the Nations, 62 West 45th Street, New York 36, N.Y. One of these is "Spring Comes to A Pond" and the other "The Florida Keys." Both are available for sale or rental in color or black and white. They were produced by Maurice T. Groen.

Briefly Noted

Indoor Plants and Gardens. By Margaret E. Jones and H. F. Clark. New York. 1953. The British Book Centre. 154 pages. Illustrated. \$4.00. House plants, their care and kinds.

A Speculation in Reality. By Irving F. Laucks. New York. 1953. Philosophical Library. 154 pages. \$3.75. Starting from the premise that all events are natural, this book connects the outstanding facts of physics, chemistry, biology and psychic phenomena.

Fishing. By Bernard Venables. New York. 1953. The British Book Centre.

278 pages. \$3.50. One of a series of books dealing with British sports, past and present.

Pheasants Afield. By Durward Allen. Harrisburg, Pa., 1953. The Stackpole Company. 128 pages. Illustrated. \$1.00. An excellent account of the habits of the pheasant and its position as a game bird.

Thunder Gods Gold. By Barry Storm. Quincy, Illinois. 1953. Storm-Mollet Publishing Associates. 166 pages. Illustrated. \$3.75. New edition, with added information, of this book about America's most famous lost gold mines.

Existential Psychoanalysis. By Jean-Paul Sartre. New York. 1953. Philosophical Library. 275 pages. \$4.75. The author blends philosophy and psychology to present a new psychoanalysis based on the principles of existentialism.

The First Book of Electricity. By Sam and Beryl Epstein. New York. 1953. Franklin Watts, Inc. 69 pages. Illustrated by Robin King. \$1.75. Simple introduction to electricity, including home experiments for the beginner.

Terra. By Gregor Lang. New York. 1953. Philosophical Library. 338 pages. \$4.75. This is a readable allegory of humanism and democracy.

Nuclear Physics. By W. Heisenberg. New York. 1953. Philosophical Library. 225 pages. \$4.75. Discussion of this important subject by an outstanding physicist.

Hunting Crows Year Round. By Charles S. Adams. New York. 1953. The Macmillan Company. 101 pages. Illustrated. \$2.95. Propaganda against the crow and instructions on shooting the bird at any time of year.

Young People's Hebrew History. By Louis Wallis. New York. 1953. Philosophical Library. 117 pages. \$2.50. Brief history of the Hebrew people from the time of the entrance of the Israelites into the land of Canaan to their classical era.

The Protestant Credo. Edited by Vergilius Ferm. New York. 1953. Philosophical Library. 241 pages. \$5.00. Ten essays on the Protestant faith by leading clergymen and professors of theology.

Dictionary of Mysticism. Edited by Frank Gaynor. New York. 1953. Philosophical Library. 210 pages. \$5.00. Brief definitions of hard-to-find and hard-to-define terms in the field of mysticism.

Baja California. By Ralph Hancock, with Ray Haller, Mike McMahan and Frank Alvarado. Los Angeles. 1953. Academy Publishers. 180 pages. Illustrated. Guide to hunting, fishing and travel in Lower California, Mexico.

Down Memory Lane. By Agnes M. Smith. New York. 1945. The William-Frederick Press. 50 cents. A collection of poems by a nurse turned poet.

Inorganic Synthesis. Edited by John C. Bailar, Jr. New York. 1953. McGraw-Hill Book Company. 218 pages. \$5.00 This is Volume Four in this highly-specialized series.

Contents Noted

ROCK Creek Park in the National Capital is unique among urban parks. Nowhere else in the world is there a basically wild and natural reservation of this calibre to be found within a city's limits. Furthermore, this park is a part of our National Park system, the most important area administered by the Office of National Capital Parks of the National Park Service. It is, therefore, a national shrine and the concern of all Americans. It is now proposed to stab at the heart of Rock Creek Park by building a six-lane arterial expressway through it. Highway planners contend that such a highway would get automobile traffic more quickly to the center of the National Capital. Actually, so far as traffic movement is concerned, it would merely move bottlenecks farther into the city. It would bring north-south through travelers into the city, adding to the traffic burden. Alternative belt lines around the Federal City are entirely practicable, and far more desirable from the point of view of traffic control and pleasurable travel of the through motorist. Strong local opposition to this desecration of Rock Creek Park has mobilized against the plan. But, more than that, a united front of national conservation groups, including the American Nature Association, is arrayed against this invasion of the park. These groups include the American Planning and Civic Association, the National Parks Association, the National Wildlife Federation, the National Association of Gardeners, the Nature Conservancy, the Wildlife Society, the American Forestry Association, the Izaak Walton League of America, the Wilderness Society, the Wildlife Management Institute, the North American Wildlife Foundation, the Sierra Club and the National Conference on State Parks. The decision rests with the National Capital Planning Commission, Washington, D.C.

UNITED States Customs officers are beating a path to the office of Austin L. Rand, Curator of Birds at the Chicago Natural History Museum. It appears that a mode of an earlier day is coming back in the form of little gilded cages occupied by artificial birds that simulate singing when a music box in the base of the cage is played. These birds, however, are covered with the feathers of wild birds. Most of these gadgets originate in Germany, but are subject to confiscation in this country. When fashion a half-century and more ago decreed that birds should be used for the adornment of women's hats, collectors made tremendous inroads into the world's wild bird population. Millions of hummingbirds, for example, were sacrificed to fashion, and feathers of colorful birds of many species were in great demand. Then came a revulsion against this practice in the United States, and in 1913 importation of wild bird feathers was prohibited by law. Exam-

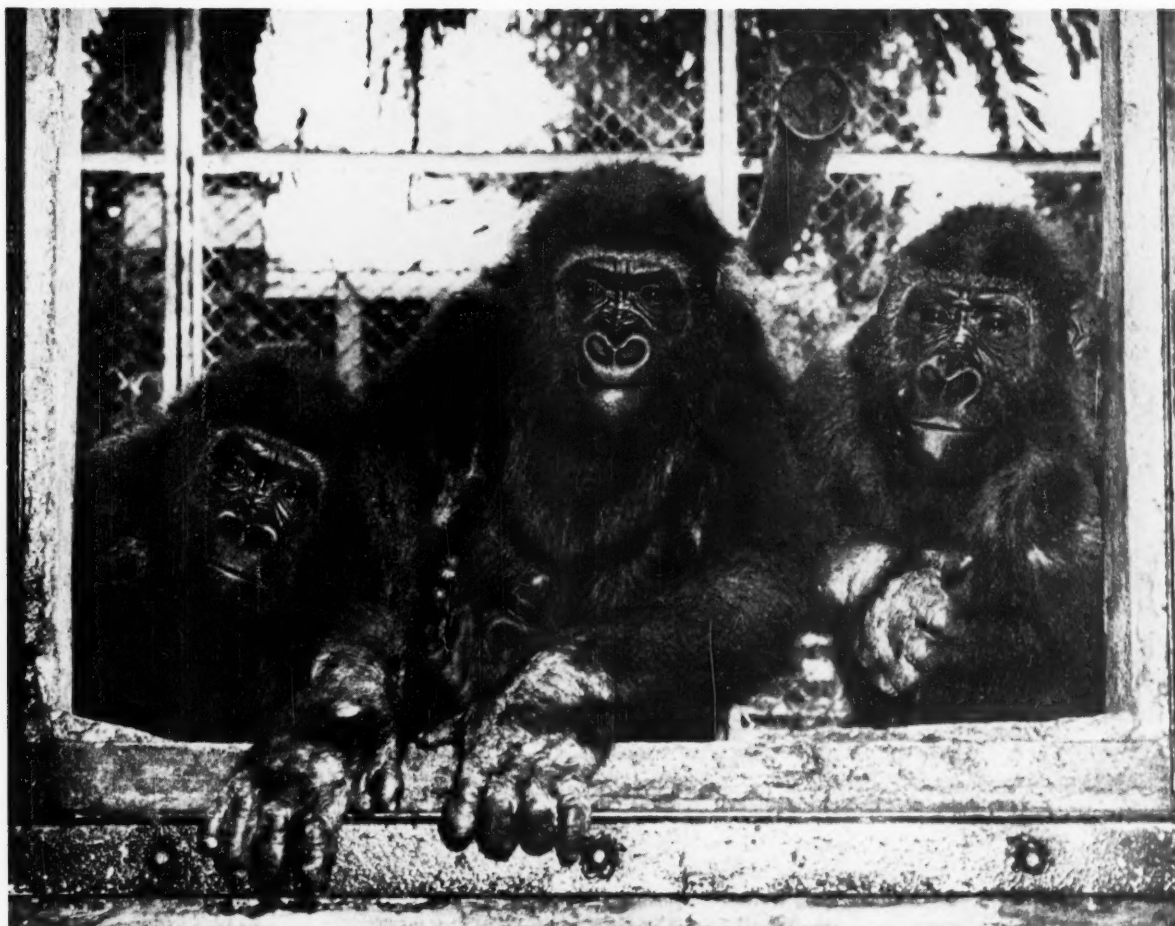
ing the birds in gilded cages, Dr. Rand found them adorned with feathers of hummingbirds, tanagers, honey creepers and other tropical avifauna. Customs officers are to be congratulated on being alert to this violation, and quick to confiscate such merchandise. Such action should serve notice to those who dictate fashion modes that they had best not resurrect the "saucy little bird on Nellie's hat."

ESTABLISHMENT of our system of national forests, education of the public to the importance of forest protection, promotion of reforestation and the development of a forward-looking forestry program came about as a result of militant activity. Among the leaders of this early movement were Theodore Roosevelt, Charles Lathrop Pack, founder of the American Nature Association, and Gifford Pinchot. Recent years have seen the growth, both in number and in power, of pressures against this forest program from lumbering and cattle interests. Thus far these have been successfully resisted by conservation groups, but the selfish interests have not been defeated. Feeling that there should be a revival of "the crusading spirit of the early days," Mrs. Gifford Pinchot, widow of the pioneer forester, has sponsored the formation of a new group, called the Forest Conservation Society of America. The Society, according to a statement from it, is not content with holding the line against forest exploitation, but would foster "an educational program to bring about a greater awareness by all citizens of the public's direct interest in forest resources." We heartily applaud return to the crusading spirit and to militant concern about our forest resources, but we are not convinced that there need be another conservation organization. There is plenty of militancy inherent in existing groups. Perhaps the move to create this new society will stir up more crusading on the part of the already activated associations.

PERCIVAL Sheldon Ridsdale, first editor of *Nature Magazine* and one of the founders of the American Nature Association, passed away on December 22, 1953, in Johnstown, Pennsylvania. He was eighty-one years of age, and had retired from active work in 1938. A Pennsylvania newspaperman, Mr. Ridsdale came to Washington, D.C., as secretary of the American Forestry Association and editor of its publication. He resigned this position in 1922 to join with the late Charles Lathrop Pack, and his son, Arthur Newton Pack, in founding the American Nature Association. Mr. Ridsdale was, also, secretary of the American Tree Association, which was dedicated to popular education with respect to forest conservation. It was the privilege of the present editor to work with Mr. Ridsdale from October, 1923, until his retirement. His contributions to conservation were quietly made, but sound, and have borne fruit as the years have passed. R.W.W.



Dr. Joan Morton Kelly, psychologist and "governess" to the three gorillas at the San Diego Zoo, holds Bata, threatening to tickle her, which always brings grins and chuckles from a gorilla.



Bouba, Bata, and Albert, who arrived at the San Diego Zoo by air in August, 1949, when not more than six months old. At that time they weighed six or seven pounds each. They are all named after places in the gorilla country.

Gorillas Are Funny People

By HERMAN REUTER

Photographs from the San Diego Zoological Society

IN VIEW of what goes on outside their cage, it is no wonder the three young gorillas in the San Diego Zoo often look as though they can hardly keep a straight face.

Their "governess," Dr. Joan Morton Kelly, personable young psychologist, who often mingles with the crowd watching them, tells of a woman who confided to her:

"You know, I saw one of the gorillas working a puzzle on television. Some jerk first showed how it was done, and the gorilla did it much better."

The woman did not know it, but it was Dr. Kelly who was the "jerk."

Zoo visitors keep asking:

"Where are the trained gorillas? When does their act start?"

There is no "act." What the trio have picked up in the way of eating with a spoon and drinking from a cup has been incidental to more serious business. That business is to some extent the finding of answers to the question:

"Just how much like humans are they?"

Dr. Kelly's charges, still mere youngsters, are Bata, 144 pounds, Bouba, 109, and Albert, 94. Bata rhymes with ta-ta, accented on the second syllable. Bouba is given three syllables, with the accent on the second. The girls, as Dr. Kelly calls them, are about four and a half years old, and Albert about four. They were named after places in gorilla country.

The three arrived in San Diego by air in August, 1949, from the French Cameroons, West Africa. Probably not more than six months old, they weighed only



Bouba investigates some of the devices used to study the mental reactions of the gorillas.

will bring him back to the business in hand, but in the meantime everybody concerned has been practically screaming.

Should you get close enough to a gorilla to tickle him he would break out in grins and chuckles.

Bouba, the belle of the trio, loves to show off. If there are sacks about, she will drape them over herself, going to great lengths to see that the over-the-shoulder lines of her costume exactly match.

Albert likes to put a bunch of grapes on his head, which makes him look like some strange simian Bacchus.

When it comes to applause, it is hard to tell whether the clapping begins with the crowd or the gorillas.

Bata has a trick of acting bashful. When Dr. Kelly

six or seven pounds apiece and, what with one thing and another, were more dead than alive. Even so they represented an investment of \$12,000, or about half their present value.

Actually they are priceless, as one Hollywood studio discovered. The movie men had the kingly attitude that they had only to crook a finger, so to speak, write out a check and the gorillas would be let out for film sequences. They were pained on being informed that the animals were not available, even if the studio insured them to the hilt, as it offered to do.

Gorillas and humans have much in common. Gorillas are apt to turn cantankerous without notice. They are ticklish. They like to dress up and show off. They indulge in what at times startlingly resembles practical jokes.

When a gorilla gets into an indifferent mood he can be trying, indeed. Albert especially has an almost human trick of perverseness. This is not at all meanness, but probably an expression of his notion of humor.

For instance, Dr. Kelly may be putting him through his paces for photographers. Things will be going along satisfactorily when suddenly he will drop what he is doing and begin to stare into space. He may devote his attention to a blank wall. Never before, his manner seems to say, has there been a wall of such extraordinary interest. Cajolery eventually



Held by Dr. Kelly, Albert adopts a most coy attitude.



Weighing Albert, and the "girls," is a weekly event, and here Dr. Kelly tells the gorilla how much he has gained in the past seven days.

brings visitors into the gorillas' suite in the rear of their big outdoor cage. Bata generally becomes contemplative and poses demurely with a finger in her mouth.

There has been speculation on whether gorillas tend to discipline one another. Bata once made off with Dr. Kelly's spectacles and dived under a bench. Since glasses are expendable and gorillas are not—Bata could have been hurt with them—Dr. Kelly dived under the bench after her. By that time the two others had landed on Bata and were belaboring her for her breach of conduct.

When the three get bored with people they are likely to act up, just as humans do. Their fondness for strangers is hardly overwhelming. One visiting student of gorillas, who came from far off to take notes, had this impressed upon him with considerable force. He was cautioned to pursue his studies from outside the cage, but one day he stepped inside for closer inspection.

When he finally emerged, he had a fresh paragraph on gorillas—and the gorillas had a wardrobe.

Gorillas do not like to be bawled out any more than do humans. The three at San Diego, as a rule, appear so eager to please their professor that even a mild reproof is enough to send them into the dumps. A word of praise, on the other hand, sets them up marvelously.

Their attachment to Dr. Kelly is almost pathetic. They whimper with eagerness when they see her approaching.

Those who have observed other gorillas in captivity are struck by the ginger and bounce of the San Diegans. Far from being sullen, sluggish and introspective as



Albert having weighed in, the photographer thought it would be an interesting picture if Bata would turn the tables on Dr. Kelly. She did.

caged gorillas usually are, they romp and scamper amazingly.

The fact is that the San Diegans are probably the happiest captive gorillas on record, thanks to Dr. Kelly's patience and unfailing kindness. She seldom raises her voice to them, no matter how balky they may be on occasion.

Naturally the problem of disciplining them increases as they grow older—and heavier. They already tend, at times, to shrug off admonishments. One thing, however, they respect—the hose used to sluice out their cages. Dr. Kelly has only to threaten to turn this on them, and they become meekness itself.

What Dr. Kelly proposes to do as disciplinarian when her charges attain a weight of 300 to 500 pounds, she leaves to conjecture. Presumably they will have to struggle along as best they can without interference.

Gorillas have their dietary vagaries. Bouba and Bata took to cereal at once, but not Albert. Even if it was baited with sugar, he turned up his nose at it. After six months, however, he condescended to sample it and became a confirmed cerealist.

They eat bananas, skin and all. Cooked prunes are among favorite items on their menus; they crack the pits with their teeth, to get at the kernels. Oranges also rate highly with them. After they break them open and eat the segments they work on the white part under the rind until only the thinnest shell remains.

They are fed celery and lettuce, and fruits in season. Tourists look on aghast at seeing them devour avocados costing perhaps fifty cents "back East." But then, nothing is too good for a gorilla.

Dr. Kelly at one time tried feeding them meat, but they did not take to it. Since they are fed hard-boiled eggs, which give them ample proteins, she decided not to press the matter.

Gorillas may very well know as much about some things as humans do. When Bata had the flu she was seen to crumple eucalyptus leaves and sniff them, for all the world as though she were quite aware that oil of eucalyptus is valuable in treating a cold.

When a gorilla beats his chest it is his way of serving notice that he feels exuberant and that, so far as he is concerned, all is right with the world. When something especially pleases him he may grunt like a little pig. An almost human shriek will show that he is offended.

The three attend classes daily. In studying their mental development and reactions, Dr. Kelly uses problems and tests devised by Dr. R. M. Yerkes of Yale for the study of the chimpanzee. These studies are modified so that they will not change the nature of the gorilla, or handicap Dr. Kelly in drawing conclusions from her tests.

Dr. Kelly has found that, compared with the orangutans, gorillas are not at all mechanically minded. They will, however, put up with contraptions to get food. One of their lessons is to sit before a table and find a tangerine concealed under one of several sliding, plywood slabs of various shapes and colors.

In a phase of this experiment involving only two choices, Bouba stood for no nonsense; she flipped a slab with each hand, thereby materially expediting matters.

With raisins as the reward, the three mastered the several steps of a puzzle having a hinge and hasp, two bolts and a lock among its intricacies. They are most apt at distinguishing shape and size. Although color is more difficult, they *can* learn it. Albert is the first to figure things out. He concentrates mightily and generally comes up with the answer.

"It has been surprising to us at the zoo," Dr. Kelly said, "what an exceptional degree of interest, concentration and cooperation the three have shown in solving

problems. For, in general, the gorilla in captivity has been regarded as rather an introverted and indifferent animal.

"Chimpanzees have undergone extensive tests in the Yerkes Laboratories of Primate Biology at Orange Park, Florida, and elsewhere, and are estimated to develop about the same intelligence as a normal four-year-old human being.

"With only a tiny fraction of data available on gorillas in comparison to that on the chimps, a definite statement as to gorilla intelligence would be premature at this point. However, I will go so far as to say that these gorillas appear to be at least as intelligent as young chimpanzees of the same age."

The three now have all their baby teeth, plus what in human babies are known as six-year molars. Bouba has cut her upper central incisor, the first of her permanent grown-up teeth. Dr. Kelly explained that where the tooth came in Bouba had had an "expectant" hole for two years, since the time she fell and smashed both upper central incisors, and the dentist had to pull them. She still carefully cracks

her peanut in the remaining empty space, rather than use her new tooth.

No gorilla has ever been born in captivity. However, the fact that precedent may some day be upset is the cause of a certain subdued air of hope and expectancy in San Diego—and of a Zoo policy, figuratively speaking, of keeping fingers crossed. The absence of neuroses in the San Diego gorillas and their apparently normal outlook tend to make Dr. Kelly optimistic.

Dr. Kelly makes no attempt to humanize the gorillas, or to teach algebra or syntax, as many have erred in assuming.

One self-important spectator was showing friends through the zoo, and they came to the gorilla cage.

"They are being educated," Dr. Kelly heard him announce with authority. "They have a girl who lives with them and they've imported three professors from all over the country to teach them."

"Three professors!" Dr. Kelly moaned. "Now I've turned into triplets."



Dr. Kelly checks on Albert's dental equipment, which appears to be in excellent shape.

Chipmunk Action

A striped rocket shoots the wall
And charges with explosive sound.

By DANIEL SMYTHE

He has his stars and hills and all,
And his own universe of ground.

The Tree that "Hates You"

By FRANK W. LOVERING

ONE of the most "vicious" trees known to man grows in the Everglades National Park, where the Florida mainland meets the Gulf of Mexico. It is classified by botanists as *Hippomane mancinella*, and is commonly called the manchineel. The seductive-looking, crabapple-like fruit of the tree is a deadly poison; the milky sap is blinding and a harsh irritant to the flesh.

Dr. Werner M. Lauter, University of Florida pharmaceutical chemist, did not believe what he was told about this tree, so he organized an expedition to learn if the stories about it were true.

In Everglades Park the chemist learned the truth, and painfully. He refused to accept at face value statements that dew or rainwater dripping from the foliage would be poisonous, or that contact with the juice would blister the skin. He doubted the story that Indians poisoned their arrowheads with an extract from the bark, and that such a potion was fatal. So Dr. Lauter started his study "to dispel unscientific belief and lay the false stories."

However, the manchineel demonstrated its powers, and the truth of the reports about it, before Dr. Lauter came out of the Everglades. Water dripping from a branch fell on one of the scientist's ears. Blisters rose at once and were most uncomfortable. In addition to these troubles, mosquitoes swarmed about the tree in dark, buzzing clouds.

Then, while he was examining the deceptive fruit, sap from the pulp worked its way through a pinhole in a rubber glove and infection followed. The doctor's right arm swelled, became paralyzed and was coated for days with ulcers.

Dr. Erdman West, mycologist and botanist of the University of Florida faculty, and Dr. Lillian E. Arnold, an associate, say the manchineel is the most toxic tree on the North American continent.

This tree grows from ten to fifty feet tall, usually on sandy seashores, and is classified as the only genus of Spurge. Trunks measure from five to six inches in diameter, but where the tree grows lushly the diameter is much more. The tree belongs to the botanical family Euphorbiaceae, and is found in many parts of tropical America, including both coasts of the Isthmus of Panama, where it forms dense thickets along the beaches. The manchineel thrives in Mexico, Venezuela, Guiana,



N. Y. BOTANICAL GARDEN PHOTOGRAPH

A poisonous manchineel tree, which has been proved to be dangerous to humans. Goats seem immune, horses seriously affected.

the West Indies, Puerto Rico and south Florida. There it grows in the lower Everglades, and has been identified in isolated locations as far north as Fort Myers and Palm Beach.

The crown of the tree is composed of long, drooping branches, which are short and thick. This characteristic makes the manchineel look like a fruit tree. The bark is pale brown and smooth. The leaves are stalked elliptical, or egg-shaped, about three inches long and half as wide, and are equipped with saw-like teeth. There is a single gland at the upper side of the stem, where it joins the leaf.

The flowers are carried on long, slender spikes. They are small, inconspicuous and of separate sexes. There are few female flowers and these are placed singly at the base of the spike. The male flowers grow in little clusters at the upper part of the spike. The deceptive fruit has an irregular stone, which carries several cells that contain seeds.

The calyx of the male flowers is two-parted; of the female, three-parted. The male has two to four stamens

joined by filaments; the female has a many-celled ovary crowned with four to eight stigmas.

The brown and white wood of the manchineel, when polished, is beautiful in cabinet work. Before a woodsman strikes his axe into a tree trunk he lights a fire around it to thicken the juice and drive off its poisonous quality. Cabinet-makers protect their faces with veils to dispel the effects of the poisonous sawdust and the exhalations of the wood.

The United States Air Force made an urgent request of the University of Florida to study the manchineel in the Bahama Islands, and the work was undertaken by Dr. Archie Carr and Dr. Emery L. Pierce. They found the tree, and also found it had toxic effects of considerable degree.

Some animals appear immune from the effects of the juices, particularly goats. Horses are extremely sensitive to it. Some birds are affected. Dr. Richard Lyon, a British physician, in 1673 wrote, in a book on the fauna and flora of the Barbadoes Islands, describing a fight between two horses near a stand of manchineel. As they reared, threw their hoofs and danced around, the bark of the tree was bruised. The flying sap blinded the animals for four weeks and caused the hair and skin to peel from their faces.

Later, another London scientist wrote that "it is a common belief that to sleep under a manchineel tree causes death. Whole woods on the coast of Martinique have been burned to clear the country of such a dangerous pest."

When the white man invaded Florida the Indians opposed him with more than bows and arrows, spears and clubs. They devised a gruesome greeting, a method of extermination by slow poisoning. Tiny twigs of the manchineel were scattered on fresh water at drinking pools where the explorers gathered; and the appealing, yellowish-green fruit, with its bright red cheeks, was placed conspicuously where it could be easily found. Almost every man died who drank the water or ate the fruit. If a man did not die he nursed a stomach ailment the rest of his life.

Perhaps the tree's most dangerous attribute is to cause blindness if a particle of the milk, or smoke from the burning wood, comes in contact with the eyes. In his narrative of the voyage of the British ship *Herald*, Dr. Seeman wrote that at Veraguas some of the vessel's carpenters were blinded several days by flying sap while they were cutting the manchineel.

The fruit abounds in an acrid milky juice and, because of the "crabapple's" tempting appearance, it has been bitten by those unaware of the burning effect upon the lips.

It is of record that Indians used the juice to poison



Dr. Werner M. Lauter of the University of Florida, doubted the poisonous properties of the manchineel tree, but a study he made of it proved that the tree is really extremely poisonous.

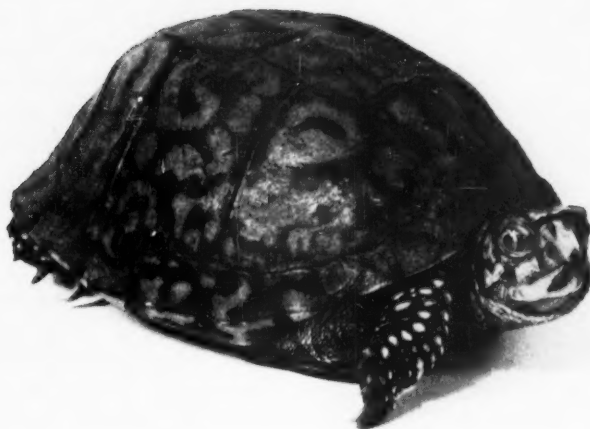
their arrowtips, but because of its excessively volatile nature modern scientists say this is impossible. Nevertheless L. H. Pammel, in his *Manual of Poisonous Plants*, published in 1911, reports that the manchineel furnished arrow poison with properties rivaling those of the deadly Upas tree.

Known antidotes for manchineel poisoning are discussed in medical terminology by Coombs in a paper, "Cuban Medical Plants." He found that the effects of the poison "may be overcome by use of *Tecoma leucoxydon* or *Jatropha gossypifolia*; and the uncooked rhizome of *Maranta arundinacea* is sometimes used for the same purpose." Salt water is also said to be effective.

Like poison sumac juice, the sap of the manchineel acts differently on different people. However, the University of Florida chemist who doubted the poisonous qualities of this tree will readily testify that it is just as well not to take any chances with "the tree that hates you."

An early drawing of the manchineel from the archives of the New York Botanical Gardens. This shows the stem, blossoms and fruit of the tree. Pictured are the male and female twigs, the upper, crabapple-like fruits being the female and the lower twigs the male.





NEW YORK ZOOLOGICAL PARK PHOTOGRAPH

"Old 1844." Evidence indicates that this turtle is the oldest living creature in this country.

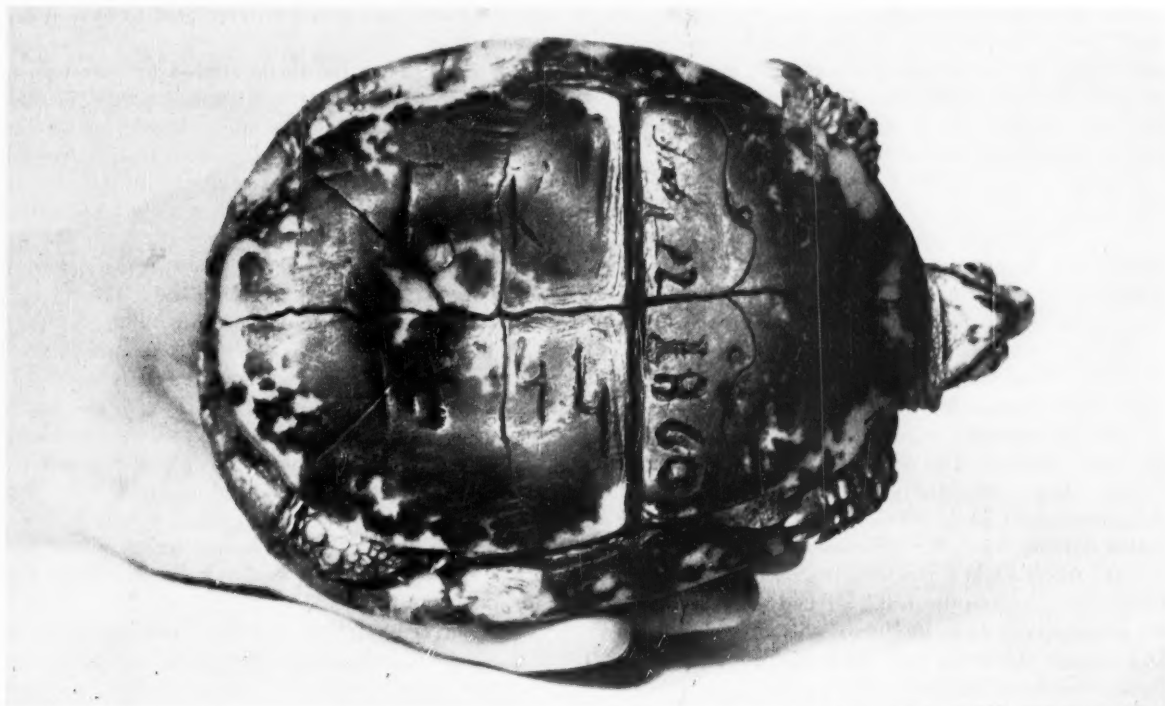
"Old 1844", The Hope Valley Turtle

By JAMES A. OLIVER

Curator of Reptiles, New York Zoological Park

A LOT of strange and peculiar creatures have crawled or hopped out of my morning mail at New York's Bronx Zoo, but I was not expecting anything out of the ordinary when I opened a neat

wooden box on the morning of last July 21. In fact, I expected to be disappointed, because I knew from the name of the sender that I would find a common box turtle, with the date "1844" and some initials carved



NEW YORK ZOOLOGICAL PARK PHOTOGRAPH

The initials and dates carved in the shell of the box turtle inaugurated an investigation that provided strong proof that the turtle is 130 years of age.



PHOTOGRAPH BY IRA ROSENBERG, N. Y. HERALD TRIBUNE

Billy Johnson points to the spot where he found the box turtle bearing the dates 1844 and 1860.

on its lower shell. It was probably a fake; somebody's idea of a joke.

The discoveries of the next two weeks clearly showed that even a herpetologist should have his optimistic moments. For investigation satisfied me, and a couple of other skeptics about date-carved turtles, that the box turtle I lifted out of that box is the oldest known native animal now alive in the United States.

The age of this turtle is 110 ostensible years, and 130 minimum probable years. But neither span is absolutely and scientifically proved. Nor can the facts be proved the way a biologist likes to prove things—doubly, triply and quadruply, and then by verification by someone else. But I submit that the evidence for this longevity record is about as convincing as can be obtained on an animal that has lived in the wild for more than a human life span.

It all started with a letter, received a few days before the turtle arrived. The postmark was West Kingston, Rhode Island; the letterhead that of the William R. Johnson Cotton Mills. The story told by the letter was a familiar one. Mr. Johnson's young son, Billy, Jr., had found a box turtle with two dates and two sets of initials carved on its shell. He had picked it up on his grandfather's farm in Hope Valley, Rhode Island. Did I think the dates were authentic, and would the Bronx Zoo be interested in having the turtle for its collection?

The obvious answers to those two questions were: "Probably not," and "Yes." The common box turtle,

Terrapene carolina, is abundant over the eastern and middle United States, from Texas to Massachusetts, and its lower shell is well-suited for the carving of inscriptions. Hundreds of people have carved dates and initials in box turtles. A good many times, of course, the dates are authentic, but some people like to record erroneous dates, giving a turtle an air of unwarranted antiquity. I have seen a box turtle which, by the evidence of its characters and condition, could not be more than 25 years old, with "1776" neatly incised in the plastron. I have heard of one turtle with "1492" engraved on its shell. Both these dates are impossibly old.

But 1844 *might* be authentic. That is only 110 years ago, and box turtles are notoriously long-lived. In the Twenties and Thirties, three of these turtles were found in Connecticut with dates that would give them minimum ages of 110, 111, and 118 years respectively—if the dates were authentic. They are recorded in herpetological literature, but there was little evidence beyond the mere dates on the shells, and no effort seems to have been made to substantiate the dates. Probably, none was possible, and data about the physical appearance of the animals is lacking. Those Connecticut turtles were examined and then liberated. Where they are now, nobody knows; run over by automobiles while crossing the road, perhaps. It may be they will turn up again; if so, I would certainly be interested in seeing them.

I replied to Mr. Johnson by return mail, saying that while I had my doubts about the authenticity of the 1844 date, I would certainly like to examine the turtle, and the Bronx Zoo would be very glad to have it for its collection.

A few days later the turtle arrived by parcel post, special delivery. It was well packed and it seemed unperturbed by its first trip out of Rhode Island. It was immediately apparent that here was, indeed, a very old animal; perhaps even as old as the earliest date of its shell would indicate. Certainly I had never seen a box turtle that looked so ancient.

The upper shell, or carapace, was still marked with the yellow streaks that are characteristic of this species, but its back was considerably worn, so much so that the horny layer of shell over the underlying bony structure had been almost eroded away in many spots, revealing the pitted gray bone beneath. On the under side, the initials EBK and the date 1844 were clearly discernible, but almost worn away in the areas where, normally, the most wear would come in the course of a long life of crawling over rough ground. It was especially interesting that there was a second date, and a second set of initials. These appeared to be G. V. B., and the date was "July 22 1860."

The character of the 4s in "1844" were not made as we make the figures today, but with the ascending and descending strokes unusually long and starting at different levels. Also, the "J" in July was peculiarly slanted, a kind of script "J" that had an air of antiquity about it. At least the inscriptions were chronologically

Samuel Reynolds, aged 85, points to the gravestone of Edward B. Kenyon, whose initials are believed to have been cut in the box turtle of Hope Valley in 1844.

PHOTOGRAPH BY IRA ROSENBERG, N. Y. HERALD TRIBUNE

correct in style! Here was a dated turtle that deserved further investigation and scrutiny!

Correspondence with Mr. Johnson revealed that Dr. Archie Carr of the University of Florida had seen a brief paragraph in a newspaper about the turtle find, and had asked to see the creature, or at least a photograph of it. Dr. Carr, a former colleague of mine at Gainesville, is one of the authorities on American turtles and author of *The Handbook of Turtles of The United States and Canada*. He is also a hard man to convince that dated turtles are authentic. I was glad that he was interested in this particular specimen, and I had written Mr. Johnson that I would send it to him for examination.

In the meantime I wanted to show the turtle to an expert closer to home. John T. Nichols, Curator Emeritus of Fishes at the American Museum of Natural History in New York, happens to be a box turtle expert, despite the fact that fishes are his professional province. Mr. Nichols lives on Long Island, where box turtles abound, and as far back as 1915 he started marking them for studies of their habits, wanderings, range, growth and age. He has marked nearly a thousand box turtles, and he undoubtedly knows more about this particular species than anyone else alive.

So "Old 1844" and I made a quick journey down to the Museum. Before I pulled the turtle out of the bag Mr. Nichols said:

"I'm sure it's a fraud. I've never seen one that I



thought would be more than a hundred years old."

I produced the turtle. Mr. Nichols held it, studying every detail carefully.

"Hm!" he said. "Hm! I'd say it had a fifty-fifty chance of being as old as the date indicates."

He reminded me that it takes twenty years for this type of turtle to attain full shell growth, and the position of the inscriptions indicated the turtle had reached full size before it was marked. Thus, if the 1844 date was authentic, the turtle would have a minimum age of about 130 years.

The outcome of that visit was that John T. Nichols scrutinized every observable feature of the creature. Increasingly enthusiastic comments lengthened the quoted



William Bridges, Lawrence Kenyon, town clerk of Hopkinton, R.I., and the author pore over the town records in their search for information that would establish the authenticity of the box turtle. Inset is writing of the period, showing the distinctive formation of the figure "4."

PHOTOGRAPH BY IRA ROSENBERG, N. Y. HERALD TRIBUNE

probability odds. As I got up to leave he said:

"I'll change my bet and make it four to one that it's as old as it appears to be."

That pleased me, because I was fairly satisfied that there was not any fake about that earlier date. Investigative method suggested looking into old records in the Hope Valley area of Rhode Island to see if there was anyone with the initials E B K and G. V. B. who lived there in 1844 and 1860. Finding them would add evidence of authenticity; more evidence than had ever before been brought to bear on a dated box turtle.

So I wrote to Lawrence Kenyon, the Town Clerk of Hopkinton Township, which includes Hope Valley, and asked him to please look through his records and see if he could turn up an EBK or a G. V. B. of the right dates. Old tax or voter lists might just give up a clue, I thought.

At that moment the Bronx Zoo's publicity department got busy. Sam Dunton, our Staff Photographer, had made excellent pictures of the turtle from several aspects, and Bill Bridges, our Curator of Public Relations, sent out stories and photographs to the New York and Rhode Island newspapers, asking for help from anyone who might know of an E B K or G. V. B. in Rhode Island a hundred or more years ago.

John Rogers of the *New York Herald-Tribune* got the Bronx Zoo's press release as a routine item in his day's work, and it struck him as an exceptionally interesting story to run down. He proposed to Bridges and me—and he did not have to twist our arms very hard to make us agree—to drive up to Hope Valley with a *Herald-Tribune* photographer and see what we could dig up.

The first stop was at Town Clerk Kenyon's office. Mr. Kenyon had to admit that he had not had much luck, although he had spent several hours poring over old town records of the 1840 period. It was tedious reading, all in long hand and in a fancy script that looked nice on the page but was mighty hard for modern eyes to decipher. He pulled several of the old, calf-bound volumes from the shelves and showed them to us.

The first one he opened happened to be dated 1844. And the 4's were made exactly as they were on the shell of the turtle—long ascending and descending strokes! We hunted for a July date. There it was—the same kind of slanting "J."

We were pleased to find even that much corroborative evidence so quickly, but it was disappointing that nowhere in the lists of voters and taxpayers for the 1844 period could we find anyone with the initials E B K. People with K as a final initial were common; Kenyon is one of the commonest names in that region, and the rolls were full of them. Barber (sometimes spelled, Barbour) was another common name. From the stand-

point of numbers alone, it seemed likely that a Barber might have been responsible for the initials G.V.B., and a Kenyon the carver of E B K. Mr. Kenyon could not recall any relative with these initials.

"But I'll bet they belong to a Kenyon," Bill Bridges declared.

We also asked Mr. Kenyon if he had ever seen a local turtle with initials or a date carved on it. He replied that he had scratched his own on a box turtle when he was a boy, much after 1844, however. He agreed to go on searching his records, as time permitted, and so our little party of turtle detectives drove on to pick up Mrs. William R. Johnson, who had promised to let her son Billy show us exactly where he had found the turtle. Together we drove a short distance northwest of town to her father's farm. Here we met Billy, age five, who seemed a bit disappointed that we had

not brought along his turtle, and no little pleased that his actions had stimulated all this interest.

Billy's grandfather, William E. Bitgood, reviewed for us the ownership of his farm back about fifty years, but could shed no light on the probable identity of the initials. He did tell us that John F. Bitgood had owned the farm just to the west of his, and he led us to the family burying ground of these Bitgoods. A quick check of the family's names revealed no one with the initials carried by the turtle.

We then went on foot, with Billy leading the way, to the spot where he had found the turtle. As we walked through the thick underbrush of the partially wooded hillside it was readily apparent that here, if anywhere, a box turtle might attain a ripe old age in comfort and with little effort. The abundant blueberry bushes, now heavily laden with ripe fruit, offered protective cover, as well as a seasonal delicacy for turtle-hunter and turtle alike. The underbrush was so thick that it would have been impossible to have seen a turtle except as it crawled along or across (Continued on page 108)



N. Y. HERALD TRIBUNE PHOTOGRAPH

Headstone of Edward Barber Kenyon, whose knife may have carved his initials and date in the shell of "Old 1844."



A herd of registered Morgan long yearlings. These horses are running out over hilly pastures, which helps to develop good quarters.

The Morgan Horse

By HOPE SATTERTHWAITE JEN

Photographs courtesy of the Morgan Horse Club

SHREWDNESS, stamina and the oldest college in America are not the only Yankee contributions to this country's development. There is also a breed of horses, the Morgan. And this breed is unique among all others in owing its distinctive traits to a single progenitor, a little dark bay stallion, foaled about 1790.

Justin Morgan, the stallion in question, for whom the breed was named, was a biological sport, or mutant. Despite research, the record of his ancestry remains hazy. Certain it is, however, that he appeared as a new type in horses. And, thanks to the prepotency of his germ plasm, he was able to stamp this type upon his descendants so indelibly that today's Morgans, one and all, bear a striking resemblance to the founder of their breed.

A small horse, ranging from fourteen to fifteen hands and from 900 to 1100 pounds, the Morgan is compact, muscular and short-legged, with a broad, fine-muzzled head, large eyes,

well-crested neck, and full foretop, mane and tail. His action is free and his appearance stylish. Noted in his early days as a harness racer, he eventually lost out to the speedier standard bred of Grand Circuit fame, to whose blood, incidentally, he contributed his share. But he held his place as a sturdy, willing worker for the farm, and a trappy, dependable carriage horse. With

the advent of the automobile, emphasis was turned to his desirable qualities as a pleasure horse for riding, while his value as a ranch stock horse is becoming increasingly apparent in the West.

Sports in Nature are the exception rather than the rule. In the breeding of domestic animals the many varieties are usually the result of careful crossing. But occasionally new breeds result from the sudden and spontaneous appearance of a mutant that not only differs from his kind, but possesses the ability to pass on his differences to his descendants.



Old Justin Morgan himself, a sport or mutation that started a long line of notable horses.



Upwey Ben Don, 8843, champion Morgan stallion under saddle in the 1948 National Morgan Horse Show.

The Ancon sheep, a short-legged breed popular for a while, came from a single ram born in 1791. And today's polled, or hornless, Hereford cattle are the descendants of one calf, born without horns in Atchison, Kansas, in 1839. Similar was the case with the Morgan horse.

Legend has it that Justin Morgan was sired by True Briton, a grade Arabian, or early thoroughbred, out of a mare of Wildair breeding who was one-quarter grade Arabian, three-quarters Dutch stock, Wildair having been, like True Briton, a well-known grade Arabian sire of those early days. No accurate record exists, but present-day opinion inclines to the belief that, although his true bloodlines remain unknown, Justin Morgan was a mixture of thoroughbred and "cold," or non-thoroughbred, blood. The horses imported from their native land by the early Dutch settlers of New York were of a light draft breed, short-legged, thickset, with heavy mane and tail and long hair about the fetlocks. The short legs and full mane and tail of today's Morgan suggest possible descent from such a breed, while Justin Morgan himself possessed feathered fetlocks, a character that has since been bred out. Other qualities, however, show the influence of early thoroughbred, or grade Arabian, stock, the same stock that, in unbroken line from three Eastern stallions imported into England at the turn of the eighteenth century, produced the running horse of race tracks the world over.

But, whatever his breeding, Justin Morgan interests both geneticist and natural scientist for himself rather than for his ancestry. Even under controlled conditions, new breeds do not occur every day. And spontaneous mutants are seen far more rarely. When such a mutant, unaided by the guidance of the scientific breeder, can establish itself for posterity, it becomes of more than passing interest to serious students of heredity.

Known at first by the name of Figure, the little bay was eventually given the name of his original owner, Justin Morgan, a New England schoolmaster. The teaching profession being considerably less well rewarded at the time of our Republic's formation than it is today, Mr. Morgan found life financially impossible in his native town of West Springfield, Massachusetts, despite the sideline of a small boatmen's tavern. In an effort to improve his fortunes, he migrated to Randolph, Vermont, shortly after the foaling of his bay colt, later destined to become famous. Could he have found a purchaser for the colt, so the story goes, Mr. Morgan would have sold him. But, as the colt showed little evidence of his future quality, offers were not forthcoming and Mr. Morgan had him brought up to Vermont. Thus in the Green Mountain State began an equine saga that today is still repeated.

The colt developed into a small, good-looking horse of a type not seen before. Scarcely more than a pony, standing fourteen hands and weighing some 950 pounds, he showed the sturdy, yet, withal, fine lines that distinguish his descendants. Not fast by modern standards, although fleet at short distances, his gaits were easy and pleasant, with a short, nervous step, a low, smooth trot and a rapid walk. Today's Morgans, incidentally, are noted for their speedy walk. He also was blessed with a happy blending of gay, but placid spirit. In tight spots he could call up that extra ounce of effort that makes all the difference. It is said that, although gentle and easy to handle, loving to be groomed and caressed, he disliked to have children about him and hated all dogs. These last two attributes probably resulted from unfortunate early experience.

In spite of his estimable qualities, Justin Morgan would in all likelihood have gone down in local annals as just another good, but soon-to-be-forgotten horse, had it not been for his ability to reproduce his likeness. Placed at stud to a varied assortment of most casually bred mares, he early showed that he could sire his own image, regardless of the bloodlines of the distaff side. Horses of the Morgan strain won recognition, first in Vermont, then throughout New England and northern New York. Of his many offspring, the names of four of his sons stand out—Brutus, Woodbury, Sherman and Bullrush. Brutus, a bay like his sire, seems to have received the least acclamation of the four. Yet he is

said to have had an exceptionally good forehead and to have shown amazing speed at short distances, even in his old age having been practically unbeatable at eighty rods. And he left a line of typical bay daughters who played their part in establishing the Morgan horse.

The most widely heralded of the early Morgans, however, was a second generation descendant, Black Hawk, son of Sherman and thus grandson of old Justin. Although endowed with looks, type and spirit, Black Hawk made his name in equine history on the grounds of trotting speed, and the power to transmit this speed to his descendants. He himself was never passed on road or race track. And, of twenty-five winners of 142 races sired by him, only seven came from mares whose breeding was recorded. As late as 1892, almost thirty-five years after his death, some 1500 horses on the select 2:30 list carried Black Hawk breeding in their bloodlines. Black Hawk sired many sons who won fame as studs in their own right, among them Stockbridge Chief, whose dam was a roan mare out of one of Brutus's bay daughters, and Ethan Allen, a name that shines with exceptional lustre in Morgan annals.

When the fleetier standard bred, headed by the Hambletonian family and descended from the imported thoroughbred, Messenger, took over the trotting field, the dauntless little Morgan returned to farm life. He also gained in favor as a stylish light harness horse. Then came the automobile. Its adoption threatened for a time the continued existence of the plucky little breed. Pleasure driving was as dead as the dodo, and the theory seemed to be that any horse was good enough for farm work. Fortunately, however, a few enterprising spirits undertook to publicize the Morgan's desirable traits as a pleasure horse for saddle use, and he has slowly made a comeback. The Army also had long had an interest in the Morgan, and many have been bred under Federal Government supervision. Within recent years the Morgan has likewise been gaining in popularity on western ranches. Established in the early nineties, the Morgan Horse Register is now a closed one, registry being permitted only to horses with registered sire and dam. Further evidence of the Morgan's present popularity is shown by the fact that in 1939 a Half-Morgan Horse Register was opened.

Perhaps the most spectacular successes of today's Morgan are the records he has achieved in competitive endurance rides. Most widely known of these is the 100-mile trail ride held annually in Vermont by the



The lovely head of Abbott, 7704, a champion Morgan stallion.

Green Mountain Horse Association. Invariably the Morgan gives a good account of himself. In the 1952 ride, for example, out of a total of sixty entries, a registered Morgan gelding was sweepstakes winner and winner of the lightweight division, registered mares placing second, third and fifth, and a high grade Morgan gelding ninth, while in the heavyweight division a high grade Morgan gelding placed eighth, a registered gelding ninth.

In its yearly national horse show, the Morgan Horse Club demonstrates, through a variety of saddle and harness classes, the versatility of its chosen breed. One class pays special tribute to the little bay foundation sire. Listed as Justin Morgan Performance, this class is open to stallions, mares and geldings, to be shown in light and work harness, and under saddle; to be judged at speed in harness (one-quarter mile), at the run under saddle (one-quarter mile), hitched to a stone boat (500 pounds additional weight), and for his showing as a saddle horse.

Such is the saga of the Morgan horse, sprung from the loins of one small, stout-hearted stallion. It would have been a fitting close to Justin Morgan's personal history if he could have ended his days well cared for, in the leisure of green and watered pastures. Unfortunately, the truth is otherwise. Justin Morgan died as he had lived, worked hard and given little care. In 1821, although aged by equine standards, he was still sound and remarkably fresh and youthful in appearance. Despite the rigors of a northern winter, he was not stabled, but kept in an open yard with other horses. One of these kicked him in the flank. The injury was left untended and inflammation set in. Exposed, without shelter, Justin Morgan died of plain neglect. Yet his qualities and spirit still continue in the present-day specimens of the breed he founded.

"Of all the stunts that man can do,
From flying down to talking,
The exercise that beats them all
Is just plain honest walking."

★

"The Vikings," and the author and his wife, discover some of the pleasures that are to be derived from just walking, and seeing, touching and smelling as you go.



Let's Take A Walk

By CARSTEN AHRENS

WHEN we returned home from a two-hour walk the other Sunday, Joe Bennett was waiting for us. As usual he was behind the wheel of his powerful car. After we had discussed business, he said:

"You say your wife, and you, and the kids walked out to Dull's crick and back. Your car laid up?"

"Why, no," I started to say, "the car's all right."

"I'll bet," he interrupted, "that old road has gone to pot. Gosh, I haven't been down there since—since I got engaged to Milly."

"No, the road's in good shape. Youngsters are still getting engaged."

He never heard the last remark.

"Car's OK; road's OK; what made you walk?" he demanded.

"We enjoy walking," I said. "We hike somewhere every Sunday afternoon, rain or shine."

"You walk," he was completely bewildered, "just for the sake of walking?"

"Heavens, no," my wife put in. "We go for the pleasures that a walk brings."

"Don't you ever walk," asked our oldest viking, "just for the fun of it?"

"Chriminelly, NO!" exploded Joe. "I live just three-fourths of a block from the drug store, and I drive there if I run out of cigars."

There are a lot of people like Joe.

They can not travel more than a hundred feet without gasoline. And a fraction of these must be moving at top speed in order to get there first. They are like a young musician I know whose ambition is to play the *Minute Waltz* in a second.

There are many kinds of enjoyment that you experience only while going afoot. A walk gives all of your

senses a chance to function. You hear, see, smell, taste and touch things that would never be appreciated by one hurrying by.

True, I have ridden with automobile drivers who hurtled through a countryside at a mile a minute and above the sound of motor and wind have heard, for a fraction of a second, the inquisitive lisp of a summer warbler, or the plaintive call of a field sparrow. But these singers must be close to the highway; one cannot hear more distant songsters. In a car one is not aware of the brook that sings itself down a slope; of the muted harp notes of the wind in a cluster of pines; of the arguments in that loveliest of swinging cradles, the Baltimore oriole's nest; of the everywhere-ness of the crescendo of the ruffed grouse's mating music; of the pulse-stirring splash of the hooked trout when it breaks the surface and the silence of a summer pool. One must be a part of the silence of Nature to appreciate the music of Nature.

And you must have time to see. Of course, you can travel by car and still see silhouettes of mountains, masses of autumnal color, towering thunderheads, or an arching rainbow. But you miss so many things, some that are fragile and lovely—the milkweed-down nest of the ruby-throated hummingbird; an indigo bunting at a forest pool; a crepuscular hawk moth siphoning nectar as it hovers above a flowering jimson weed; the fairy umbrellas on the liverwort; the "eggs" in the "bird's nest fungi;" the flight patterns of wild geese and pelicans; the venation of a dragonfly's wing; pine needles against the sky; the silhouette of a great blue heron, or a tern flying against a nor'easter.

For some smells, speed is a blessing. I have been thankful to be able to drive (Continued on page 109)

Dry Ice Does the Trick

By PETER C. CROLIUS

Photographs from N. Y. State College of Agriculture

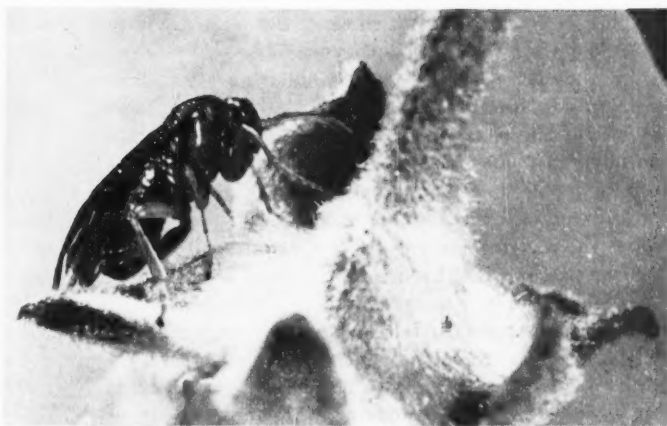
SOME bugs have been taken out of insect photography. As a result, there is bigger and better fruit on New York tables. Imaginative photographers at Cornell University have developed a unique method of taking insect pictures. Now northeastern fruit growers have a chance to see what orchard pests they are fighting.

Fruit is big business in New York State. For years extension entomologists have been trying to solve production problems brought about by injurious insects in the orchard. They have used every trick in the trade to help growers get rid of fruit pests, using lectures, interviews, bulletins, movies, books. But the real problem lay in growers not being able to identify the pests correctly, or to know at what stage in their development to kill them. Before a cure is found, the sickness must be known.

Photography seemed the logical answer. If entomologists could show orchardists what specific bug was responsible for what specific damage to this tree or that fruit, the battle would be half won. Seeing is believing—believing, in this instance, means death to the harmful insects; cash in the pockets of the fruit growers.

Pictures by the thousands have been taken of insects, but too few show the insect pest in his natural surroundings, in his natural coloring, or in lifelike form.

Insects are notably poor subjects for portraits. They just will not sit still long enough to allow the camera to be adjusted and the picture taken. Lighting is difficult to arrange, since both light and heat further increase the



The European apple sawfly poses for his picture on an apple blossom. This particularly active pest was slowed down for the photograph by using dry ice both to cool and gas him. The body lustre and apparently normal attitudes of the wings and legs would have been impossible to capture from a dead insect.

creatures' activity. The task of the photographer is somewhat like that of a barber giving a two-year-old boy a haircut.

Entomologists and cameramen asked themselves, "How do we slow these things down?" Heretofore, photographs were taken after the bugs were killed in a cyanide jar; dead, they curl up, retract their legs, and relax wings and feelers. Extension men wanted to show them alive.

So experimenting started. Ether and chloroform in small doses were tried without success; they killed the insects. Moth crystals and ammonia gas produced the same results. Carbon dioxide gas showed signs of success at first, but it proved to be difficult to handle since the least air movement dispelled the vapor. Remembering that cool weather makes houseflies seek the warmth of buildings, photographers tried partial refrigeration with ice. It either killed the pests, or had no effect.

Then dry ice turned the trick! The experimenters reasoned—and rightly—that dry ice might have a combined cooling-gassing effect on their subjects. Dry ice, of course, volatilizes, giving off carbon dioxide gas as it changes from solid to vapor.

The first trials resulted in neatly deep-freezing the insects, but subsequent tests, varying the distance between ice and subject, gave satisfactory de-activation. By putting dry ice in a bowl, adding a stiff cardboard disc, and plac-

Cameraman and entomologist, acting as a team, gang up on an insect to add its picture to their invaluable collection. The photographer in the foreground holds the camera's cable release as the entomologist prepares to give the pest a cooling-gassing "dose" from dry ice on the spoon. A large mass of dry ice is in the bottom of the bowl separated from the subject by a disc of cardboard.



ing the insect atop the cardboard, the photographers started getting the pictures they wanted.

Like any process, this Rube Goldberg method had, and still has, its wrinkles to iron out. Beetles and some species of moths are relatively insensitive to both cold and CO₂ gas; they must be given double-strength doses of cold and gas, and, even then, often have to be caught on the run. On the other hand, smaller kinds, like the mites and midges, succumb easily and must be given the lightest treatment. Unfortunately, as a general rule, the smaller the insect, the more active it is.

Double doses are administered with a spoonful of dry ice brought near the insect when he shows too much activity. The mass of ice below him, plus the short doses from above, are enough to slow down the majority of unfeeling species.

There is the problem, too, of trapping the insect at the right time, in the specific development stage desired. Apple midges, for instance, appear in the orchard for only two or three days a year. Other species of pests remain in a particular phase only a few hours. Also, transporting the subjects to the laboratory is a ticklish job;

the mortality rate is high once the insects are out of their own surroundings.

The camera used by the Cornell photographers is a Leica 35 mm.; it is supplemented by a double extension bellows, to bring out the finest detail, and mounted on a special focusing mount. The bellows extension necessitates a longer exposure and a wider lens aperture than those used for conventional photographs. The relatively long exposure further justifies a slowing down of the insect. One entomologist has been quite successful in using a Kodak "35" with a portrait lens salvaged from the optics of an Argus C-2.

Using the dry ice method, more than 150 photographs have been taken, the majority made into color slides for showing before growers' meetings, in schools, granges, and so forth. Begun for fruit men only, this photographic specialty has broadened to include insect pests of importance to many phases of farming—vegetable crops, dairying, floriculture, forestry, and others. Extension specialists now get the word to farmers faster, more easily, and with greater understanding because of this work by Cornell's imaginative photographers.

The Female Is Deadlier

By ELEANOR GRAHAM VANCE

The bee that flits around my yard
I hope will be a he-bee,

For I just learned the one that stings
Will always be a she-bee.

Leadplant, Lover of the Open Prairie

By RALPH J. DONAHUE

Photograph by the Author

WHEN summer days call for flowers on the prairies, or on the land that once was prairie, a host of dry plains-dwellers are quick to respond. Not the least of these is the leadplant, *Amorpha canescans*. It is a member of the Pea Family, and, during late June to August, displays a most un-pea-like blossom-clustered raceme.

The individual lead flower has only a single petal, which is purple and tiny, and is adorned with stamens of orange that, in some positions and lights, give the flower assemblage a golden halo.

The plant's odd, pinnate leaves are gray-green, and appear to be covered with whitish fur. The flower ranges from Manitoba to Louisiana and westward to New Mexico and Montana. Mid-western species sometimes grow to twenty-four inches in height. Other names for the lead plant include purple amorpha and false indigo.



Birds of Spine and Thorn



By JOHN L.
BLACKFORD

Photographs by the Author

Cactus wren, typical feathered "home-steader" of the cactus lands.

ACROSS torrid, shimmering cactus flats, in dense mesquite and catclaw tangles, hidden behind bayonet blades of yuccas, winged dwellers of the fantastic Sonoran deserts of our Southwest build secure homes and raise their young in a seemingly hostile and forbidding environment. But the cactus wren, verdin, road runner, the Palmer, Bendire and crissal thrashers, the canyon towhee and Scott oriole are desert-wise and wily. Long ago these birds learned that fierce thorn and treacherous spine offered haven, not death, to those who learned desert ways. Now by habit and adaptation they live in harmony with the menacing plants of this grotesque land. From such formidable homes as the cholla, yucca and prickly pear they defy the desert's searing heat and relentless drouth. Avian pioneers, they have cleverly won the fight to survive in one of Nature's toughest outlands.

Other, more familiar species have moved in with them. Some, like the big, magnificently soaring red-tailed hawks,

resort to the upreaching arms of the giant saguaros to nest; others, like the house finch, expertly build their cradles in the same barbed and seemingly evil spines of the "jumping" chollas.

Here on the superheated creosote bush and cactus flats, in the pebble-paved cholla "meadows," amidst saguaro "forests" of desert foothill and mesa, the thirsty, wide-rooted plants stand well apart. Only in mesquite and thorn-tree thickets is there continuous cover. Yet the armament of individual plants is such that each is a nearly impregnable fortress in itself.

And what armaments they bear—the leaf-daggers of yucca; the stiff, interlocking spines of barrel and giant cactuses; the hooked barbs of tornillo and cat's-claw or tear-blanket; the sheathed, barbed and treacherous spines of cholla; thorn-edged sword-leaves of sotol; and the tiny, devilish spicules featured by prickly pear.

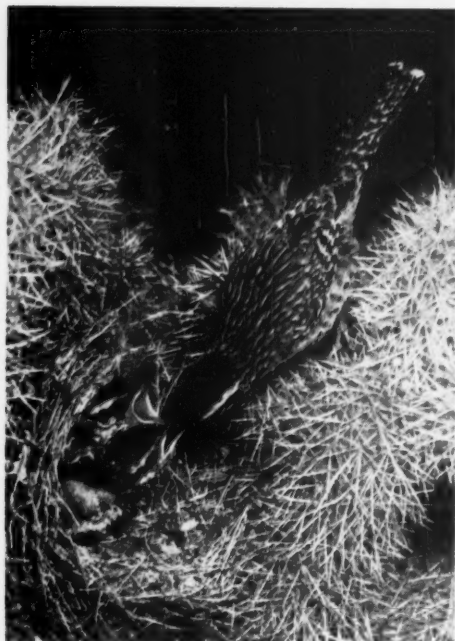
Higher, on hot rocky slopes, spike-pointed leaf-rosettes

A Palmer thrasher on its nest in a golden-spined "jumping" cholla. Note how neatly the bird has clipped off each barb-tipped spine above her nest entrance.

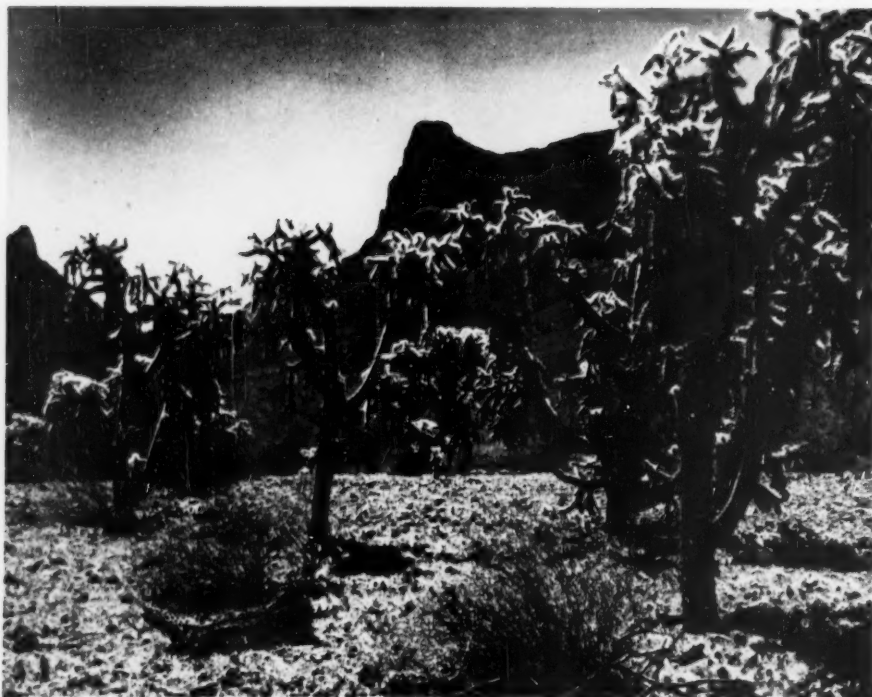




In the blossoming arms of a saguaro, (left) a pair of red-tailed hawks have built their bulky nest. These great rodent-hunting hawks are almost entirely beneficial. Hardy tree yuccas still scatter across the arid, grassy pavement of Sulphur Springs Valley, Arizona, this one crowned with the stick nest of a white-necked raven, an efficient scavenger. Appearing to ignore the treacherous spines, the cactus wren places its globular, hay-stack nest in the dangerous maze of the teddy-bear or golden-spined cholla. The light golden or silvered crowns of this species is one of the beautiful sights of the cholla cactus "meadows."



Even more weirdly than the desert's needle peaks lifted against the sky, grotesque tree-chollas (below) raise spiny, forbidding arms above the desert's stony floor. Yet these fierce cactuses safely cradle the nests of many desert-wise birds.



of agave defend a little grass against persistent close cropping of hard-trampling livestock. And here ground-nesting birds find small islands of refuge.

How so many feathered sprites thread the dangerous depths of their guardian plants without paying the penalty is a mystery. Yet rarely, it seems, do the deft-footed desert birds meet with disaster. Then, usually, it is some inexperienced fledgling impaled upon the fiercer cactus. Once, however, far out on the sun-tortured Hassayampa Plain, I found an adult mockingbird lately crucified, and dangling from the terrible cholla spines.

Everywhere throughout the vast, alluring, although often desolate reaches of the Southwest, birds are the true children of spine and thorn.



Under a low canopy of black and straw-gold spines, two young mourning doves wait safely until they can take to wing. On slight contact with cholla spines, an entire bristling joint drops off upon the unfortunate victim. For her nest in this formidable cactus, observe how the dove has greatly improved upon her usual careless and flimsy structure.

Shadowed by bayonet leaf-blades of a tree yucca, nest and eggs of a western mockingbird are strongly guarded by the spiked armament of the picturesque plant. Here many "daggers" have been drawn aside. As with several of the thrashers, the mocker also may use thorn-studded twigs in fashioning her cradle-nest. Eggs are varying shades of blue and green, spotted and blotched with cinnamon brown.





The adult little chorus frog, *Pseudacris ocularis*, is barely one-half inch long. These tan-colored elves of frogdom breed from January to September. The female lays about one hundred eggs, which is relatively few compared to the twenty thousand eggs deposited by a bull frog.



The pine woods tree frog, *Hyla femoralis*, averages one and one-half inches in length. It is a master of blending with its environment. If you cover the eye in the photograph above, the frog seems to become just a part of the loose bark on the tree trunk on which it is perched.

Frogs of the TreeTops

By C. J. STINE

Photographs by the Author

HAVE you ever mistaken the song of a frog for the melody of a bird? It is not unlikely, for many of these vociferous amphibians sing while perched on shrubs and trees.

Of the one hundred or so species and subspecies of North American frogs, thirty belong to the tree frog family, Hylidae. The round discs these frogs have on the ends of their digits enable them to clamber up and down vertical objects, defying gravity with amazing ease.

The smallest of these interesting tailless amphibians is the little chorus frog, an habitue of wet grassy areas along the coast from North Carolina to southern Florida. They hop to and fro on blades of sedges, the males expanding vocal sacs one-half the size of their bodies, emitting shrill, cricket-like chirps. When it comes to jumping, the little chorus frog is a champion, for he can propel himself thirty-six times his own length! A bull frog cannot come anywhere near this record.

The pine woods tree frog, and the barking tree frog, are

The barking tree frog, *Hyla gratiosa*, is the largest native tree frog in North America. It is known to residents of the southeastern United States as the barker because of the striking resemblance of a chorus of these frogs to the barking of dogs. It can easily change its color scheme.

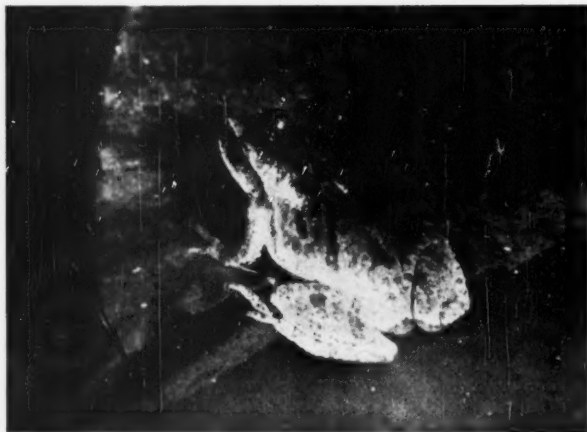
found throughout the same coastal strip as the little chorus frog, but the former extends north to Maryland, and both species are found west to Louisiana. These frogs inhabit the trees of the pine barrens, breeding in swamp prairies and cypress ponds.

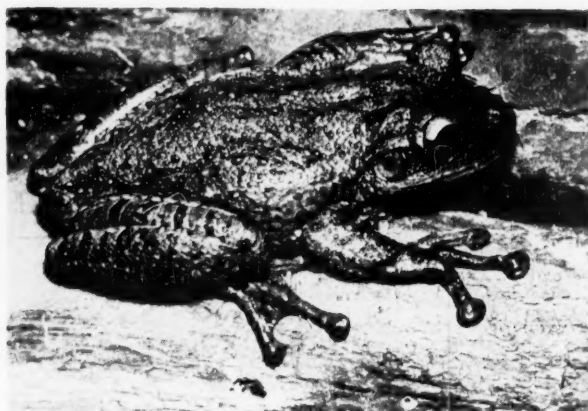
The pine woods tree frog is an especially nimble climber and on a warm humid evening can be heard singing his metallic staccato song in machine-gun-like bursts, perhaps from the stately crest of a high long-needled pine.

The "barker" is our largest native tree frog, averaging two and three-fourths inches and is considered by many as our most beautiful. Certainly, its ability to change its color pattern is unexcelled.

Consider a group of animals that can sing like birds and insects, throw their voices, climb trees as well as monkeys, change color, hop prodigious distances in proportion to their size, have hundreds of offspring, and are equally at home in the water and on land, and you have the tree frogs, truly fantastic animals.

The most commonly heard of the tree frogs is the spring peeper, *Hyla crucifer*, of the northeastern States. The specific name refers to the cross-like marking on its back. It is difficult to observe because its protective coloring is so effective. Its call is greatly out of proportion to its size.





The giant tree frog, *Hyla septentrionalis*, hails from the West Indies, but has become established around Key West and on some of the lower Florida Keys. This tree frog may be as large as five and one-half inches. It is sometimes cannibalistic, preying on other smaller frogs. The author placed one of these giants in a container with a half-dozen squirrel frogs. Later there were none of the latter. With large suction cups on its toes, this frog clings to the sides of concrete structures.



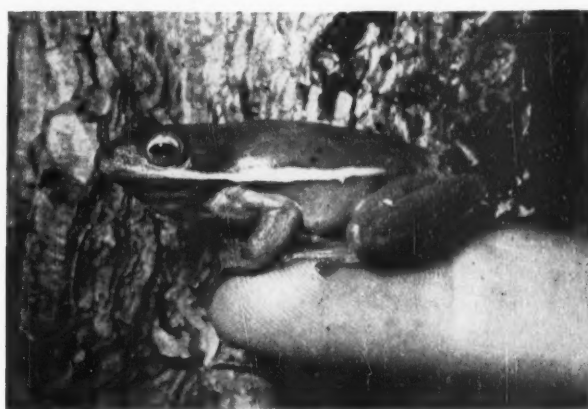
The bird-voiced tree frog, *Hyla phaeocrypta*, is a master of ventriloquy. The author's first encounter with this frog was when he pulled to the shoulder of the road crossing the Ogeechee River in Georgia. There was a distant chorus in the tupelo swamp along the river. It seemed distant and was a bird-like, twittering call, now strong, now ebbing. In reality, the frogs were close at hand, perched on saw palmettos and branches of trees at chest level.



The common tree frog, *Hyla versicolor*, is our most common tree frog. Here one sits on a log, its vocal sac inflated as it trills to its lady love. This frog is common over the entire eastern United States west to the Great Plains. It somewhat resembles the bird-voiced frog in color, pattern and size. However, it may be identified by the yellow inside its thighs, while its bird-voiced relative is marked there by green blotches.



The squirrel tree frog, *Hyla squirella*, is often mistaken for the green tree frog, but is chunkier, and lacks the black borders on its yellow side stripes. It can change from green to brown at will. This frog hides in crannies about buildings in the day, and emerges at dusk to search for food. There are few gasoline stations in Florida where this frog is not seen at night, clinging to the windows and awaiting insects that are attracted to such places by the lights.



The green tree frog, *Hyla cinerea*, is the most commonly heard tree frog in the South, its song resembling the quacking of a duck. It is known locally as the rain frog because its call is believed to be a signal that rain is to be expected. It is not, however, an accurate forecaster, because, like most frogs, it may call even in sultry weather. It is a beautiful frog, bright green, with a light stripe on its side. It has been described as "aristocratic-looking."



The Anderson tree frog, *Hyla andersoni*, is the rarest of the arboreal amphibians of North America, although it may be common in places within its limited range. It is found in white cedar bogs in southern New Jersey and North Carolina. Its specific name comes from the town of Anderson, South Carolina, where the first specimen is supposed to have been taken. This record is somewhat doubtful since it is no longer found there.



Mounting Butterflies

By WOODY WILLIAMS

Photos by Author

CATCHING butterflies is perhaps the easiest part of the hobby of forming a collection. The work really begins after you get them home and they have dried to a brittle hardness with wings folded. Mounting them in a lifelike manner, so that they will display their colors and interesting patterns to best advantage, requires patience and a few simple tools.

Dr. Edward Ross, museum entomologist, here demonstrates how even beginners can learn to mount butterflies in a professional way. Dr. Ross has charge of the extensive collection of butterflies, moths, beetles and many other groups in the entomology department of the California Academy of Sciences, San Francisco.

First step is to place the butterfly in a relaxing jar (top, left) for a day or two to soften brittle wings. A quart mason jar with two inches of sawdust in the bottom, moistened with water until soggy, will suffice. A few drops of carbolic acid should be added to prevent mold. A disc of cardboard over the layer of sawdust will keep it in place. The jar should have a tight lid.

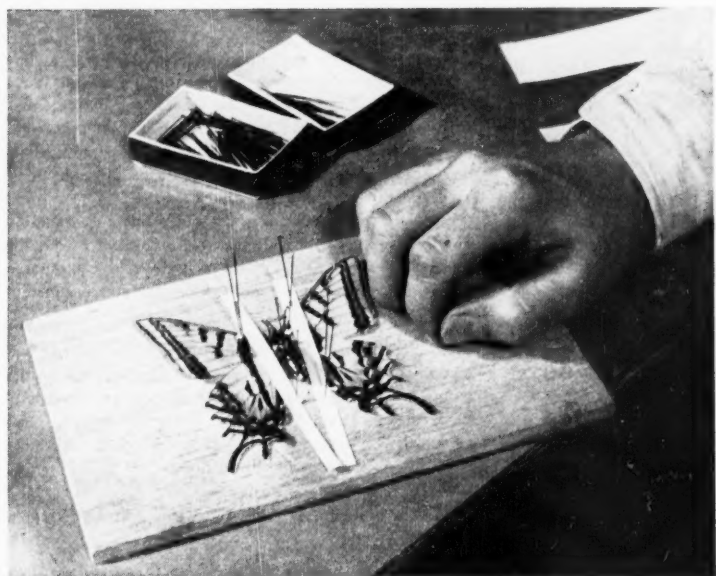
Dr. Edward S. Ross (top, right) removes a dried swallowtail that has been stored in a triangular-fold envelope. Relaxing jars for amateur use need not be as large as the one shown here.

Once the butterfly wings are soft enough to bend easily downward from their folded position, they may be removed from jar. Hold butterfly by its body not wings. Insert an insect pin (available at biological supply houses) through the thorax, which is the structure to which wings and legs are attached. If butterfly is mounted within 12 hours after it is caught, relaxing jar will not be needed.

After the pin is inserted through the thorax, pin the butterfly upside down to a smooth soft surface, such as balsa wood or a piece of corrugated cardboard (right). The top of a hat box also can be used. Notice forceps at left, which also are used in manipulating butterfly.

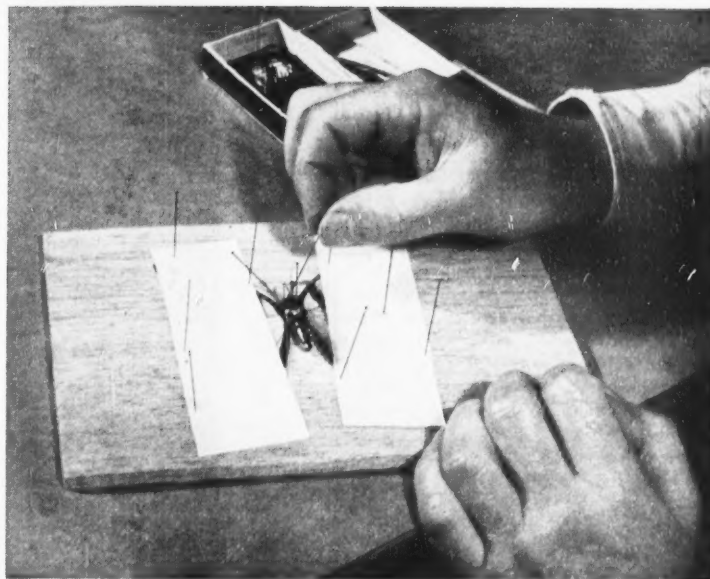


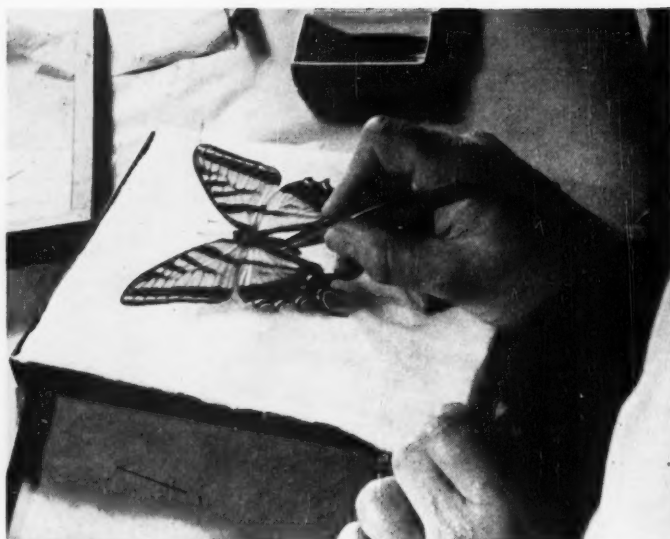
Once the butterfly is pinned down, insert other pins on each side of the body to keep the insect from turning while wings are moved into place. After body pins are in place, insert an insect pin, with a small paper square attached, through the front wing of the butterfly just behind the large rib along the front of the wing. Then move the wing forward until its back side is at right angles to the body. Pin it in this position, then move the other front wing in the same way.



Pin down the back wings with one pin each, placed just behind a rib so as not to tear the delicate membrane of the wing, then place two strips of paper over the wings to hold them flat. Again notice the small cardboard squares on each wing, which help to prevent tearing insect's wings.

Next, place two strips of paper over the entire wings after removing the first pins placed to hold wings in place. These strips hold wings flat and prevent them from curling around the edges. After the strips are down, adjust the antennae so that they run in the same direction as the front of the butterfly's wing.



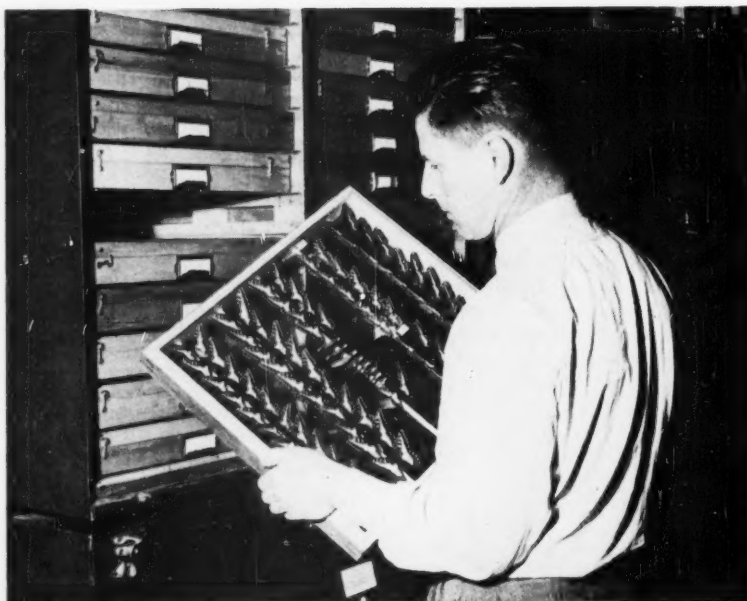


Add your own label to the mount (above), stating the butterfly's scientific name, the place where it was caught, and the date. One thing more: Keep the mount in dim light, since bright sunlight will fade the colors of the butterfly. With this precaution, your specimen should last a lifetime.

Dr. Ross, who has charge of the large scientific collections of butterflies, moths, beetles and other insects at the California Academy of Sciences in San Francisco, reveals some interesting museum displays, right. Here butterflies and other insects are mounted in large drawers, which slide in and out of cabinets for easy storage and quick examination.

After removing the hardened butterfly from the spreading board, it is ready to mount in a box with a glass lid (above left). You can buy these boxes from any biological supply company, where they are known as Riker Mounts. Or you can make one by cutting out most of the top of the box as a frame to hold a pane of glass over the specimens. A piece of sheet cotton is placed in the box to support the butterfly without injury. Before placing the butterfly on the cotton, tamp a depression for its body with the forceps. Notice how the butterfly is held by the pin through the body. When dry, the insect is extremely brittle.

Hold the butterfly (above, right) with the forceps and work the pin out of the body, then lay the insect on the cotton. Before sealing with a lid, place a few crystals of PDB, or other moth repellent, under the cotton. This chemical will kill book lice, which are noted for eating dried butterflies.



Resources for the Future

★ An Editorial ★

SOME fifteen hundred industrialists, businessmen, educators, research scientists and conservationists met in Washington in early December for the Mid-Century Conference on Resources for the Future. They sought an answer to the question: "How can we mobilize our resource base—land and its products, water, minerals, and energy—to support the continuously expanding demands of a growing population and contribute to sound economic growth and national security?"

Resources for the Future, Inc., was created through a grant from the Ford Foundation, and the recent gathering was financed from funds thus supplied. President and Executive Director of the organization is Reuben G. Gustavson, and Lewis W. Douglas served as Chairman of the Conference.

Complete report on the meeting would—and will—require many pages. Report of the conclusions of the several sections will be published, following review, and a more extensive report on the deliberations will be forthcoming later. However, Resources for the Future is a permanent organization. It will be a force in the resources picture, and a brief report and evaluation seems pertinent.

The Conference had three basic questions to which all discussions were directed.

1. Will the Nation's resource base be so diminished during the next 25 years as to precipitate a series of critical situations?

2. Can such situations satisfactorily be left to extemporaneous solution, or have we reached a point in our economic development when it is desirable for industry, government, and citizens to work toward coordinated resource study and action?

3. Do we know enough about our resources, their interrelationships, the possibilities for substitution and technological advances, and the needs and resources of other nations, to make it possible to foresee and mitigate critical situations?

Instead of trying to arrive at any conclusions through votes and resolutions, the Conference sought to establish areas of agreement and disagreement. No specific program for resources was immediately sought, but rather it was hoped to provide a groundwork for the making of policy by private and public agencies. This should be the meeting's contribution.

In its endeavor to accomplish these objectives, and to shed as much light as possible on the three fundamental questions, the Conference broke up in eight sections, with subsections of all but two of these. The assigned subjects were Competing Demands for Use of

Land, Utilization and Development of Land Resources, Water Resource Problems, Domestic Problems of Non-fuel Minerals, Energy Resource Problems, U.S. Concern with World Resources, Problems of Resources Research, and Patterns of Cooperation. Two dinner sessions were devoted to the questions "The Public Lands—Who Should Control Them?" and "How Much Should We Depend on Foreign Resources?" A closing session heard the summarized reports of the session chairmen, which later will be published.

The divisibility of the human animal being definitely limited, it was necessary for those in attendance to concentrate on that section the individual regarded as of primary interest to him. This made for isolation, somewhat complicated by the fact that attendance at the Conference was about three times the original conception and about twice that finally expected. In some sections this overcrowding resulted in a good deal of talking by a few and in less of a "working" session than might be desired. Also some of the agendas were so large that often their component parts were only superficially explored. Also, as was inevitable, there were instances of special pleading and "axe-grinding," which slowed down the work done to some extent.

At the final session, however, the expertly prepared section reports served to tie the Conference together and to give clues to the future of Resources for the Future. Actually, there seemed no logical substitute for the section approach used and it had its assets as well as its liabilities.

Opinions will, no doubt, differ as to the over-all value of the meeting. In our opinion, based upon attendance throughout and on many conversations, the Conference was a definite contribution to solid thinking on resource questions. Many whose approach was entirely that of business and industry were exposed to the thinking of those who have devoted themselves to conservation, or the wise use of natural resources. And conservationists were exposed, in turn, to the viewpoints of the user of resources. High-level educators were numerous and their contact with the views developed cannot but be helpful. Some conservationists, and other interests, thought they were outnumbered. A few labor groups withdrew, thus making sure they were outnumbered. It seemed to us that there was a very good balance of viewpoints.

All in all, we feel that Resources for the Future can take an important place as a force for wise resource use, management and conservation. It will be interesting to watch its development, and the manner and direction of its influence.

John Cassin

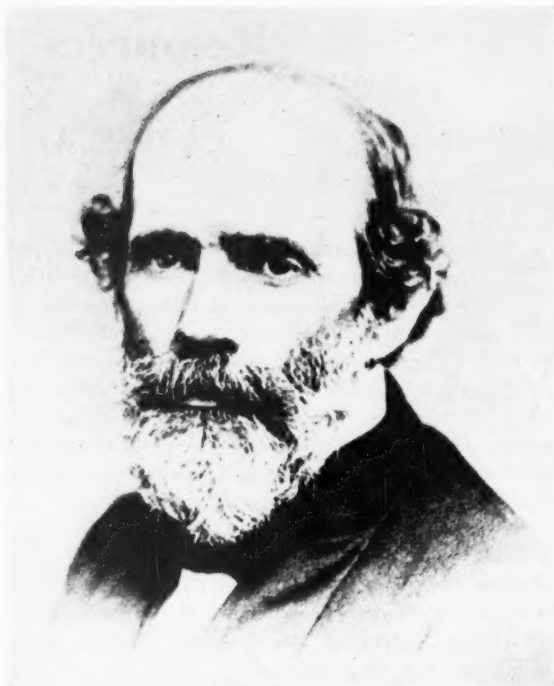
By W. L. McATEE

CASSIN'S program for success in ornithology seems to have been learned in the commercial world. Reminiscently, he said, "Great is life in the woods, and the greatest of all sports is bird collecting, but to become a scientific ornithologist is quite another business." Such was his goal and he attained it. A contemporary, Thomas Mayo Brewer, asserted that, "as a general ornithologist . . . Cassin had no superior in this country or elsewhere—it may even be doubted if he had an equal." And Witmer Stone, a successor to the same curatorship that Cassin held, stated that, "during the time of his greatest activity he was the first ornithologist of America, both Baird and Lawrence doing their most important work somewhat later."

An account of his scientific career may well be prefaced by brief reference to his origin and to his business experience. He was born of Quaker parentage, September 6, 1813, near Chester, Pennsylvania, and was educated in a school maintained by that sect and also by private tutors. Coming to Philadelphia when he was twenty-one, he engaged in business and, upon the death of the head of the firm in which he was employed, Cassin succeeded him. This was the Bowen lithographing company, one of the best of its kind, which under Cassin produced plates illustrating reports on government explorations and surveys, and other scientific publications. For a time he held a position in the Custom House, and he also served for some years on the Philadelphia City Council.

Cassin joined the Academy of Natural Sciences in 1842, eight years after coming to Philadelphia, was elected curator the same year, and vice-president in 1864, both of which positions he held the remainder of his life. He was also corresponding secretary from 1849 to 1852. His activity and zeal won patrons for the organization, none more helpful than Dr. Thomas B. Wilson, who afterward became its president. By the aid of Dr. Wilson, the Academy brought together a collection of some 25,000 bird skins, the largest in the world at that time, and a library of all available publications on systematic ornithology.

Thus Cassin's success formula became apparent—get the best possible equipment and use it with all possible energy. He worked evenings, Sundays, and holidays, and produced fifty-six papers that were published in the *Proceedings of the Academy*. These included reports on collections purchased and catalogs of birds of various families in the museum of the institution. He was author, also, of several important reports published elsewhere, including: "Illustrations of the Birds of California, Texas, Oregon, British and Russian America" (1853–1855), a work dealing with fifty species not described by Audubon; "Mammalogy and Ornithology of the United States Astronomical Expedition



John Cassin, 1813–1869

to the Southern Hemisphere, 1849–1852" (1855); and on birds of the "Expedition of an American Squadron to the China seas and Japan, 1852–1853" (1856); of the "United States Exploring Expedition to the South Seas" and around the world, 1838–1842 (1858); and contributions on rapacious and wading birds in Volume IX (1858) of the *Pacific Railroad Reports*, in collaboration with Spencer Fullerton Baird and George Newbold Lawrence. In all he described 194 new species of birds, largely from Africa.

This student's devotion was to the technics of ornithology in description and synonymy, which he brought to new high standards. Writing to Baird about one of his papers, he said, "the way it upsets, reverses, and otherwise interferes with everybody's names is a caution; it will make some of them wonder why they did not look into a few of the old books a little sharper." Brewer appraised Cassin's works as "distinguished by their careful research, their thoroughness, and their unflinching accuracy."

As to his personality, Stone wrote, "Brusque manner and determination made enemies, though at heart he was kind, and to his friends always cordial and genial." And Brewer added that he "was of unswerving uprightness, warm-hearted, cordial, and sincere, firm and abiding in his friendships, and only a foe to whatever was wrong, ungenerous, or illiberal—possessed of strong, fervent and generous impulses, and frank and outspoken in the expression of his opinions." We may also quote Baird, who met Cassin on his first trip to Philadelphia in 1840 when he was 17, Cassin 27, and the Woodhouse mentioned 19, years of age. (Continued on page 106)

We Build Bird Houses

By THAD A. BUKOWSKI

WERE it possible, it would be interesting to find out what the birds think of the building boom in bird houses going on in our school. We hope that they approve, for the project has reached the proportions of a housing development, more than two hundred and fifty avian dwellings having been completed in three years. And, in the process, many odds and ends of stray house siding, orange crates, nails, varnish and paint, annually left over by residents of the community, have also been utilized. Such raw materials are at a premium at the time of year the construction project gets under way.

Some ninety houses were brought to school last year, designed for occupancy by birds from wrens to wood ducks. Every student in my biology classes participated, and what houses they were! The latest group included a painted, gabled and completely shingled edifice modeled after a substantial home. It was undoubtedly designed for some regal winged couple. There was a pink-colored cottage for a romantic duo, and a bird airport, with flying pennants on poles and a boldly lettered sign reading "Bird Port." Apparently the latter was constructed to attract a jet-minded couple of speedsters of the flying tribe. Yet another included a TV

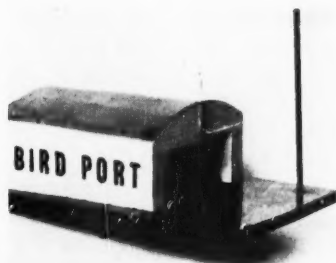
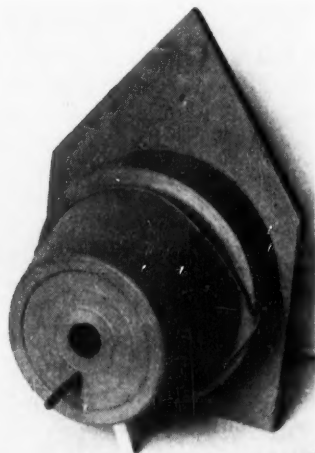
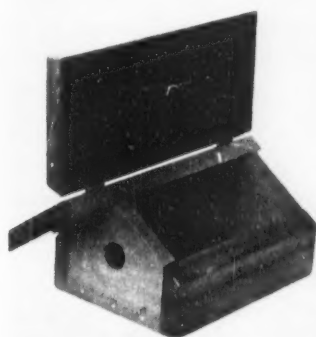
At the right, two of the bird houses brought into class. One indicates how a mail box may do special duty, the other indicates the importance of having a lid that can be opened so the house may be cleaned out in fall.



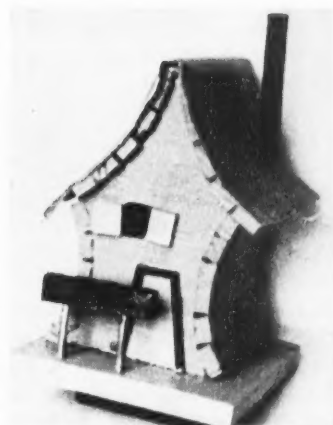
Two students in the author's biology class with some of the houses in the avian building boom.

antenna, to make sure that its occupants would be up to date in every respect. Finally, someone who apparently knew nothing about the correct use of hammer and nails wired a flower pot sideways to a wooden wall and carried in a most unusual combination indeed. This last bit of genius seems to suggest a use for unwanted or discarded flower containers, for the hole at the bottom is the exact size of that recommended as an opening for certain birds.

During the three years that this diminutive con-



A flower pot proved to be a ready-made bird house after a little attention. Above, a home for the jet-minded bird. At the right a home that was submitted by one of the girls, and adorned tastefully with startling colors.



struction boom has been carried on in my biology classes, we have tried to tie it in with both a local Optimists Club bird house contest, and National Wildlife Week. To help in presenting the latter idea to the public, representative groups of the houses are displayed in windows of local retail establishments each year. The project attracts much attention throughout the school, and is enjoyed by all the participants, who welcome the challenge of competing with one another in construction strategy.

Strangely enough, the girls bring in the more substantial houses, more intricately designed, and, of course, more beautifully painted. I suspect that many a father and boy friend have sweated late hours, matching sides and adding the asked for hinges, which, used in strategic places, permit the removal of old nests and the preparation of the homes for new occupants each year. If others are pressed into service as architects and builders it adds to interest in birds, Nature, and the living world around us, which is, of course, the idea behind the whole affair. If bird houses are built in such numbers most of them are going to be put out and, we hope, used by the birds, and the builders will observe nesting habits and other interesting aspects of bird life. The practical value of fostering bird life is obvious when we consider their appetites for insects. The needs of birds in winter are emphasized in the project, so feeding stations are accepted in lieu of bird houses.

Perhaps the birds themselves do not need the paternalistic care that houses provide, for, as a rule, they can forage for themselves, even in the most inclement weather. But a practical project like this directs the students' attention to observation of what these pleasant creatures do, and their economic value. The school room into which the bird houses come may smell a little heavily of a mixture of linseed oil and paint, but it can be stood for a week or two until the houses are taken home to be put up for the spring mating season.

Each year some unusual incident seems to threaten our project, but it has weathered the mild storms of impatient mothers and occasional irate fathers. As a rule, the parents have cooperated, even those of one student who fell out of a tree and sprained a leg.

Sometimes the students delay in taking the houses home, so once I volunteered to hang or nail the remaining ones myself. With an acre and a quarter bordering an extensive suburban woodland available, I began placing them with the "aid" of my two-year-old daughter. At one awkward moment Beth wobbled too near the road, and I left a bird house in a low crotch not four feet off the ground. I forgot it for some days, and when I remembered the unfinished task I found a couple of robins at work constructing a home against the roof of the house. This showed the preference of the robin for shelves, even if open, to closed nesting boxes.

Every house that I have ever set out has been occupied. It is not advisable, however, to place them too densely, as birds need an area around the home in which to forage for their food. Different sized houses, attract-



The author, diverted by his small daughter's rambles, wedged a bird house between tree limbs and forgot it. When he remembered, he returned to find that robins had set up housekeeping on the roof, not inside.

ing different kinds of birds, may be set out in an area, because some birds are primarily insect-eaters, whereas others are seed-eaters, and still others may subsist mainly on the ant life found in almost every locality. Care should be exercised not to create too much competition, however.

Birds can be attracted in many ways. Winter is a good time to start, when their food is relatively scarce and when we can supplement their rations. Any season, however, will do if our interest is a persistent one. If we are just starting, a number of areas around the home can be provided with food intended to attract bird guests. Beef suet, which they greatly need for body heat, is highly favored by the birds and can be tied to small branches of trees in many places. Several small chunks are preferable to one large one. Sunflower seed, peanut butter spread on crackers, cracked nuts of all kinds, and almost all cracked grains, including scratch feed, are delectable fare. At the beginning, the English sparrow may be first attracted, but even these invite other birds by their presence. After birds have been attracted, and depend on food that is set out, feeding places may slowly be reduced in number.

Birds, like most other animal life, also enjoy other accommodating facilities. It is not only the human, for instance, who enjoys a dunk in a bath. Bird baths are a boon during the summer and the birds will splash as much per pound, and sing much sweeter songs, than the

average human bathroom vocalist. Last year my two little children and I enjoyed watching birds cheerfully "bathe" in the sand pile.

Bird houses may be built of all sizes generally ranging from 4" x 4", for small song birds, to 6" x 8" for larger ones. "Homes for Birds," a bulletin of the U. S. Fish and Wildlife Service, gives all details about bird house construction. Houses may be painted, or left un-

painted, hung from six to fifteen feet above the ground, and usually are more successful when firmly lodged in a single tree or on a post, rather than swung by a wire or placed in a wooded area. The opening should be sheltered as much as possible from the wind and rain.

Build a bird house, if you can, as a soul satisfying experiment. The birds that occupy it will bring their joyous song nearer to your heart.

The Clouds Are Nice Today

By LOUISE MAYERS MEREDITH

It cannot be that we are in the air;
this is the sea;
Deep down below marine formations live.
No, not the earth away down there
Through shimmering aqueous blue transparency.
Not roads and rivers,
Houses, forests, cars, mountains, hills—
Nor is the sea surrounded by white sand
But white of egg whipped up to grand,
gigantic, sunlit peaks
Exempt from rain
Cut by the blade that is an airplane—
(The reassuring hostess stops to say,
"Don't hurt your eyes. The clouds are nice today.")

World's Largest Seed

By HUGO H. SCHRODER

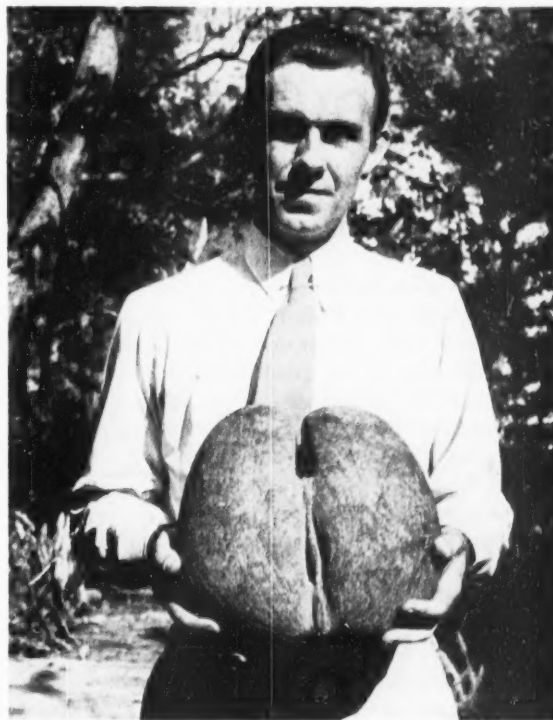
Photograph by the Author

MANY years ago some strange-looking, giant seeds began to drift in to the shores of the Maldive Islands, in the Indian Ocean. Being scattered by the winds and waves, no one knew what they were, nor whence they came. Finally the home of the tree from which came this giant was discovered. The tree was a member of the palm family, growing on the Seychelles Islands off the east coast of Africa. The name given to its seed was *coco-de-mer*, or coconut of the sea. Its Latin name is *Lodoicia maldivica*.

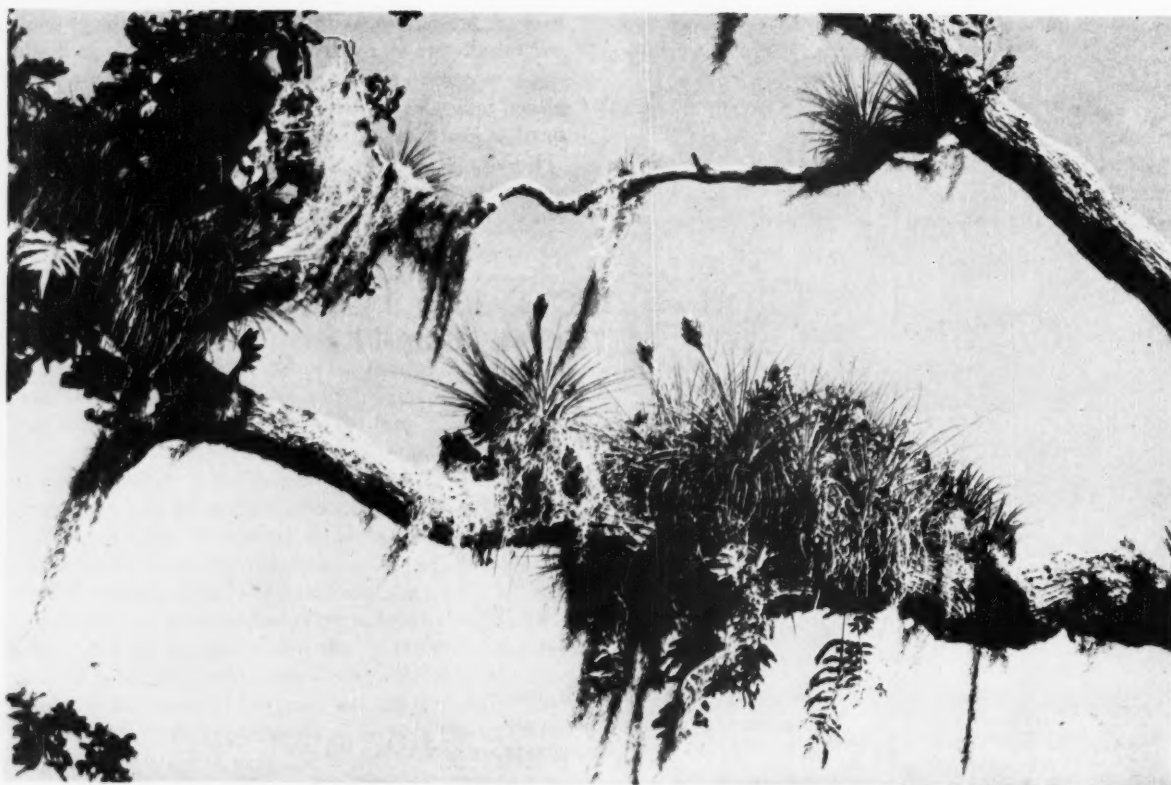
These huge nuts grow on extremely tall trees, often one hundred feet in height. When mature the seeds may weigh fifty pounds or more. An outer husk covers the large, lobed nut, the inside being soft and edible before maturing.

The tree has large leaves, which, when young, are used as material for making baskets. The older leaves are used for thatch. The hard shell of the mature nut can be carved into a variety of ornaments.

The nut shown here was sent to a Florida nurseryman, who collected all sorts of strange seeds from all over the world, and experimented with tropical plants. However, he did not try to grow the *coco-de-mer*, for it takes some years before it germinates, and would have



taken thirty years or more before the palm was of bearing size. In addition, it might be dangerous to grow such a tall tree that bears such huge seeds at maturity, for it would be risky to nap under such a tree.



Branches of an oak that has invaded earlier clearings on the lower slopes of the Honduran mountains is festooned with bromeliads and ferns.

Cousins of the Pineapple

By LOUIS O. WILLIAMS

Photographs by the Author

FROM my home in the valley I can see plainly, glistening in the moonlight, the cloud that covers the summit of Mount Uyuca. There will be clouds like it there almost every night during the long dry season, which starts in south central Honduras each year about Christmas time. The high mountains of the central part of the country will all have such cloud-caps during the nights of the dry season, nocturnal crowns that make possible the luxuriant cloud-forests that grow on these peaks, the summits of which reach well above the surrounding highlands.

The cloud-forest on Mt. Uyuca, and on most other of the adjacent peaks, extended farther down in times past. Man has come to tear at the edge of the forest to find fertile soils for his maize. So, with time, a new kind of forest has come in; a forest of a more transient kind and made up of pines and oaks.

Below the cloud-forest on the mountain slopes and passes, and in places where the nocturnal mists pass through in the dry season, these pines and oaks are often heavily adorned with bromeliads. These trees, which have invaded the abandoned clearings originally made

in the cloud-forests, seem to be the preferred hosts of plants of the pineapple family.

Such tree-dwelling plants, epiphytes if you like, are often exceedingly abundant in this zone of night mists. Curiously enough, even though the number of individuals is almost innumerable, the variety of species is not great. The families of plants represented among these arboreal members of the flora are few. Mainly they are bromeliads, orchids and ferns, with an occasional cactus or aroid thrown in as if as an afterthought.

The bromeliads, cousins to the pineapple, are the most abundant and showiest of the kinds of plants that have their homes on these fog-drenched trees. The short, chill days of winter find them coming into their glory.

Bromeliads have been my friends, both north and south of the Equator, but it was not until I came to Honduras that I saw such great quantities of them. Broad-leafed trees are most often associated with epiphytes as hosts. In highland Honduras the pine is perhaps the commonest host for the bromeliads. It is an association that leaves one with the feeling that

Tillandsia punctata, in flower, has found a pine tree as its host.

something is "out of order,"—an association that should never be. But the abundance of bromeliads growing on pine trees indicates that the association is "right."

The dry season, from November or December until May, or even June, is harsh in many parts of the highlands of Central America. During the days of most of the dry months, the trade winds blow across Honduras, gently, unrelentingly. Evening usually brings an end to the wind except for minor air movements. The warmer air, brushing against the high and cool mountain peaks during the night, brings fog formation, and condensation of moisture to the plants. It is simple to tell where these fogs form or pass in the dry season. Where there is no fog formation there are no bromeliads, or but few of them.

The bromeliads seem to know where their moisture comes from, too. The sides of the pine trees that are toward the direction from whence the gentle winds come are crowded with plants; the sides away from these fog-bearing winds are almost bare of plants. Even on the twisted, gnarled and much-branched oaks the bromeliads seem to prefer the side toward the wind, although often there are plants nearly all over these trees in positions where they can sit upright.

Even toward the end of the dry season most of the bromeliads have at least a small amount of water stored



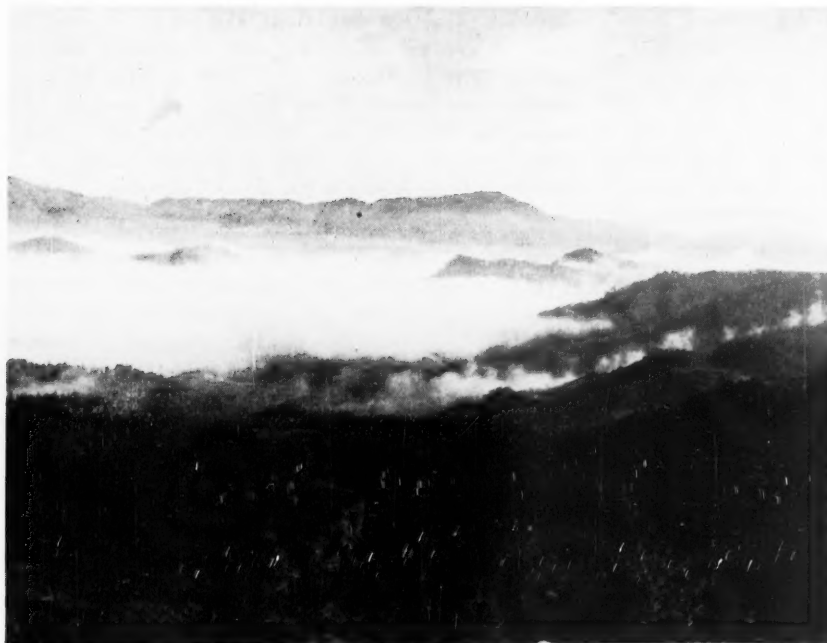
in the base of the rosette of leaves. Here is a most efficient reservoir for any moisture that may come its way.

The kinds of bromeliads that occur up on the mountain, where there is available moisture from the fog, soon show signs of distress if they are brought down to my home in the valley and are not watered frequently. If they are given the water that they require they may grow and flower down here in the edge of the warm country, even though they are never really at home.

The bromeliads of the valley and the warm or hot country are quite different from those of the highlands, being usually much less colorful and far from beautiful. But the lowland plants seem to be able to withstand the dry season without adverse effects.

Bromeliads of still another

Fog clouds fill the valley and it is in such an environment that the bromeliads grow best.



kind grow in the cloud-forests on the summits of the higher mountains. They are similar to those on the oaks and pines lower down, but usually they are not so showy. Most of them have their leaves in rosettes for the retention of water. Often they grow in such masses that branches are broken off with their increasing weight. This aids the botanist to collect plants that he would not get otherwise. I have found two species that have come down in this way, but have never found them otherwise.

Bromeliads, the cousins of the pineapple, are almost entirely American. One lone species grows in Africa. The tropical and subtropical regions on both sides of the Equator abound with a prodigious number of plants in wondrous variety. Parts of Brazil and of the Andean countries of South America are exceedingly rich in species. Many kinds seen in the Andes will remind one of familiar plants of the Central American mountains. Species of epiphytic plants are often dispersed over a wide geographical area, but are usually found under similar ecological conditions, whether they are north or south of the Equator.

The leaves of the bromeliads that grow in the cloud-forest are mostly quite glabrous and are much thinner than those of the inhabitants of the lower slopes and of the warm country. They need no mechanism to preserve their moisture for this is almost always sufficient.

When forest trees are cut down, or are toppled by the wind, the bromeliads soon perish. Within two or three days of the time that a tree is felled the epiphytic plants are usually so far gone that they will not even make good botanical specimens. The moisture usually drains away from the rosette in the process of felling the tree. It is possible, also, that there may be some reaction to the shock of the fall. Most epiphytic plants, including orchids, which do not store water in the same manner as do the bromeliads, soon are of no value when found on trees of the fog forest that have fallen to earth.



Bromeliads prosper on the rough bark of pines, clinging to it and growing in abundance. Most of these grow on the side of the tree that faces the prevailing winds of the dry season.

During the Christmas season several kinds of bromeliads are prized for decoration, and are to be found in markets and are offered for sale by peddlers on the street. The custom of using them for this purpose seems to be limited to one time of year, perhaps because the ones with the showiest bracts are at their best about this period. Most of the showy kinds used for decorations belong to the genus *Tillandsia*.

Wonder

By ELIZABETH
PHILLIPS JONES

Dusk's purple curtain
Falls
And the dark owl
Calls.

Hush't and inarticulate
I feel
As night's blue shadows
'Round me steal.

The mellowed gold
Of the evening skies
O'er the mauve-touched brown
Of the hilltop lies,

O'er the wooded dell
Where ferns moss-bedded sleep
And stately trees
Their vigils keep.



PHOTOGRAPH FROM THE NATIONAL PARK SERVICE

Mt. Wynn in Glacier National Park, Montana. Across the bottom of the mountain, just above the talus slope, the fault line is exposed. The whole mountain is part of the mass pushed out on the prairie.

Montana's Marching Mountains

By PAUL SHEPARD, JR.

A LEGEND of the Blackfoot Indians tells of a brave who climbed a high mountain on the western border of the plains empire to communicate with the great spirit. As part of the mystic ritual he carried a bison skull to be used as a pillow. He fasted for many days and finally his mission was fulfilled. He descended from the peak and vanished into the anonymity of his race and life on the prairies. But his hard, shining "pillow" remained, to link the legend with present reality.

The first white man to surmount the pitches of Chief Mountain's towering cliffs was a young man named Henry L. Stimson, who was looking for adventure in one of the last wilderness areas. Later he was to become an important public figure. On the day of the ascent, in 1906, he and two companions, one a Blackfoot Indian, discovered an old, weathered bison skull lying between the rocks on the summit of the peak.

Chief Mountain is part of a chain of the northern Rockies in Glacier National Park. To the east it overlooks the rolling hummocks of the Great Plains. The morning sun rises over a sea of grass to illuminate the walls of its 4600-foot face.

Besides the religious respect, the awe and mythology that the Blackfeet attributed to the peaks along the rim of their domain were associated with a mistrust of the precipitous topography. This ruggedness is especially striking as one approaches from the east. The solitary peaks along the range edge look like ships. Their "sail-

ing" is out over the prairie, and the analogy is more than pictorially appropriate.

The chain, at least eighty miles long and fifteen miles wide, has been pushed out on the prairie as a single unit. This mass, the "Lewis Overthrust," has been so heavily eroded that elements of it remain almost isolated. Chief Mountain is one of these, rising in particular grandeur because of its vertical front and singular position.

The Overthrust is a supreme example of a thrust fault. Pressure deep in the earth's crust has uplifted the Rocky Mountains. The lifting was uneven, its pulsation and direction irregular. Here the forces were outward not up. Where this lateral heaving was greater than the rock's resistance large sections were sheared off. The Lewis Overthrust appears to have been moved like a cement slab.

The Indians' superstitious respect was based on what could be seen, and we realize today that he could see a fearful mountain mass unobscured by foothills because the mountains themselves had marched over the place where the foothills would have been. Borings indicate that the Overthrust, of which Chief is a part, has traveled at least fifteen miles eastward.

In some places the line that separates the overthrust mass from the earth beneath it is visible. Most of the romance of the Indian days is beyond recall, but present fields of wonder and exploration are in store for the explorer who is seeking understanding of earth forms. A

The forces that build mountains bend layered rocks as though they were elastic. Pressures on this shale were probably from one side. An upward fold is called an anticline. When it breaks a fault develops.

NATIONAL PARK SERVICE PHOTOGRAPH

climb to the fault line in Glacier Park is a challenging undertaking; there are no trails and the way is steep and rugged. On Chief Mountain this line is buried below the rock fragments, or talus, around its base, and the climber crosses it unaware.

Wherever the fault line can be seen it is of special interest, not only because it is the contact face of the sliding mountains, but because of the age and nature of the rocks. The older material, shoved up obliquely from depths as great as six miles, has been pushed out over the more recent prairie rocks.

This older rock is above the fault line. It is a hard shale, or argillite, dating back to pre-Cambrian times, more than a half-billion years ago. It is notable for its sedimentary origin, formed on the bottom of a sea that once glistened where the Rockies are today.

The softer rock that it has crunched over is a mere 75 million years old. It is also sedimentary, but still reflects its origin as mud. In it are fossil clam shells and other evidence of life, their remains extending for hundreds of miles eastward across Montana and parts of the Dakotas. There is no record of life in the older argillite.



The line of the overthrust is easily visible across the base of Mt. Wynn in the Many Glacier area. It is gently tilted downward towards the west and appears to be only a pleasant walk away. Actually it is more than a thousand feet above the valley floor, beyond thickets and windfalls that appear only as a green carpet from Many Glacier Hotel.

Our climb through these dense forests of spruce and pine began by a difficult crossing of Cataract Creek, rushing down the canyon from the famous pale blue-gray of Cracker Lake. Once on the foot of the mountain it was merely a matter of holding a course through alternating young growth, with its hundreds of crowded trunks, and old timber, whose virgin shade falls across a ten-foot thickness of windfalls.

The last few hundred yards are up a talus slope of giant boulders, some as large as small houses. At the head of the slope is a segment of the clean, straight crack, its little dimension spanning eras of time.

In the southeastern part of the Park, back from the front of the overthrust, a stream has cut its way down through the fault line and into the younger rocks below. This land feature is called a *fenster*, or "window."

Interested visitors to the park almost invariably ask, "Is the overthrust still active?" To this the geologist can give no certain reply. Delicate seismographic instruments record earth tremors and tiny quakes in the Rockies every year. These are probably the effect of crustal movements, which have uncertain relationship to the Lewis Overthrust. The Rockies are still young and may still be adjusting.

Recently, erosion by giant glaciers has far

The fault line on Mt. Wynn, goal of a long scramble up the mountain. Above the line are ancient, pre-Cambrian sedimentary rocks, a half-million years older than the shales below.



Chief Mountain is a "mountain without roots," for its connections with the range have been eroded away. On its peak was found the bison skull involved in an Indian legend. Beneath its foot, somewhere under the debris, is the fault line that separates it from the younger rocks of the prairie.

outstripped any movement of the overthrust, if there has been any. These valley glaciers have occupied the troughs between peaks periodically during the past few hundred thousand years, abrading the mountain sides and transporting vast quantities of rock to the prairies, where it was deposited in moraines.

The scenery for which the Park is famous is related to the uplift and thrusting, but the shapes of the individual peaks are the effect of the rasping action of rocks frozen in the rivers of ice. The many waterfalls in the area owe their stair-step character to the layered nature of the sedimentary rocks. And finally, since the glaciation ended, various weathering processes, such as frost wedging, have produced talus slopes and minor erosion features on the steeper slopes.

On top of all this is the wildlife. The overthrust block, like a sled, carries a fragile forest wilderness and

animal life. A few of these animals spend their lives in close relationship to the geology, dependent directly on the rocks for shelter. The bighorn sheep and mountain goat spend most of their time above timber line, thriving in the cool heights of the raw, clear, upper world. The steep slopes, defense against cougar and coyote, are their enemies as well, for rockfalls and slides are the worst dangers faced by these dwellers of the high places in the mountains.

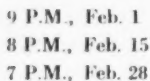
The coney, or rock rabbit, lives in the talus—where the weasel hunts it. High on the cliff faces the golden eagle nests. He alone inspects the rocky walls inch by inch like a swimmer among the reefs. One may wonder whether his bird mind reflects upon the nature of the great cliffs that Pierre de la Verendrye, explorer for Louis XIV, named "The Shining Mountains" on New Year's day, 1743, when he first came upon them.

Could They Be Tears?

By HELEN WARD GALL

Could they be tears—those few remaining strands of silver foil
That drip in limp and vagrant disarray
Where they eluded sacking hands with purpose to despoil
That stripped the shining ornaments away?

But yesterday a thing of dazzling beauty, laden-limbed—
So soon the hour of triumph disappears!
A Christmas tree, atop a bulging garbage truck, untrimmed
Except those silver strands—could they be tears?



★ 1ST MAGNITUDE

● 2 ND	11	10	12
● 3 RD	11	11	11
● 4 TH	10	09	08
● 5 TH	10	00	09

tions Mercury is usually about as bright as the brilliant Vega or Capella. On occasion it may be even as brilliant as Sirius. Once detected, one can usually observe it on clear evenings after sunset, or mornings before sunrise, until it has once more drawn in too close to the sun to be detected in the brilliant twilight.

If one finds Mercury so difficult to observe, since it is always so close to the sun, Venus easily wins the distinction of being the most easily recognized and the most brilliant of all planets, although its angular distance to either side of the sun can never exceed about 48 degrees, and it never rises more than about $4\frac{1}{2}$ hours before the sun or sets more than $4\frac{1}{2}$ hours after the sun. As a morning star or evening star Venus is an object of great splendor that draws the attention and admiration of the most casual observers of the beauties of the heavens.

There is no finer stellar object in view when Venus appears above the horizon. Even when in the far part of its orbit from the earth, around the time of superior conjunction with the sun, Venus outshines by far any other planet, although it is at such times not far above the horizon and visible in bright twilight. Venus is about fifteen times as bright as Sirius and is six times as bright as Jupiter at his best, or Mars at a most favorable opposition.

The two inner planets are in the morning sky from time of inferior conjunction with the sun, when the planet passes from east to west of it, until it reaches superior conjunction with the sun, when it returns to the eastern evening sky. During that time it will remain west of the sun and will be a morning star. From time of superior conjunction with the sun to that of inferior conjunction once more, the planet will be east of the sun. It will set after the sun and be known as an evening star. It will disappear from view in the western sky in the twilight some days before coming into the position directly between earth and sun that it occupies at times of inferior conjunction. It will be some days, more or less, depending upon how bright the planet is and how rapidly it is moving, before it can be seen again in the morning twilight.

The two inner planets exhibit phases similar to those of the moon when viewed through a telescope. At the time of inferior conjunction the unilluminated side of the planet is turned toward the earth and the phase is that of new moon. If one had the privilege of viewing the planet with a telescope so that its disk-like appearance, as distinguished from the point-like brightness of a star seen telescopically, could be observed, it would be noticed that when it first appears as a morning star,

some days after inferior conjunction, it has the phase of a crescent moon. As its distance west of the sun increases its phase is still that of a crescent moon gradually getting wider until, when farthest west of the sun at greatest western elongation, its phase is that of a half-moon. This changes then to that of a gibbous moon, as seen between first quarter and full moon.

The disk of Venus decreases in size as its distance

from the earth increases; and the illuminated portion of the surface now increases, compared to the unilluminated part, until at time of superior conjunction it has the same phase as the full moon, although invisible once again from the earth because the sun is between earth and planet at this time. After superior conjunction the planet is next seen as an evening star, as soon as it is far enough east of the sun to escape from the bright glare near the horizon. Its phase is now the same as that of the moon, from full moon to last quarter. That is, the phase is again gibbous but with the illuminated part of

the disk decreasing instead of increasing. At the time of greatest eastern elongation it has the phase of half-moon. From then on the planet has the phase of a narrowing crescent until it disappears, and the phase becomes that of new moon again, at inferior conjunction. From superior conjunction the planet has been an evening star. What is known as a synodic revolution of the inner planet has been completed, from inferior conjunction to inferior conjunction once more. During this synodic period the planet is a morning star for the first half of the period and an evening star for the second half, and during the whole period it passes through all the phases of the moon.

The synodic period for Mercury is 116 days, and for Venus it is 586 days. This period of revolution of a planet around the sun, as seen from the earth, is longer for an inner planet than its revolution around the sun with respect to a fixed point in the heavens back to the same point again, which is called its sidereal period. This is 88 days for Mercury and 225 days for Venus. As the earth is not fixed in position in the heavens, but is also moving around the sun in the same west to east directions as the planets, it makes the period of revolution of the planet around the sun—as viewed from the moving earth from conjunction back to like conjunction—longer and more complicated than the planet's sidereal revolution around the sun.

The outer planets also have their synodic periods of revolution around the sun; but as seen from the earth the motion of an outer planet (Continued on page 108)

Polaris

By WILLIAM JAMES SHEPPARD

Polaris, star of North, that through the night
Led on the hunter to his rest afar,
The guide explorers had, the sailors' sight,
Though most stars change their place, you
constant are.

If hid by cloud, you still return to view,
The road sign of the sky, the brightest sphere
Of Ursa Minor. On this earth, as you,
Polaris, make the way to North quite clear,
So truth, in world of error, is our road mark
To show us all the way to set our course.
For truth in all we do is our first spark
And truth, the polar star of life, is source.
Through life, let truth forever guide my way
And give me power to learn, to know, to say.

The School Page

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

ONE GOOD TURN DESERVES ANOTHER

SINCE the Boy Scouts of America were incorporated, nearly forty-four years ago, these young Americans have been trying to become better citizens by practicing the habit of doing good turns. They would be the last to deny that their good turns have not been matched by their adult sponsors, and, on the whole, the public has shown its approval in many ways. It happens that in March, 1954, the public is to have an unusual opportunity to help the Boy Scouts "help other people at all times." This is because the 1954 Scout Good Turn is to center around conservation, and a sound conservation program does help other people at all times. Many readers of this page are in a position to help Scouts make this effort for 1954 a real success. We hope that we may here make suggestions that will be welcomed by many.

Briefly, the 1954 Scout Good Turn program calls for three types of activity. During Wildlife Week, sponsored by the National Wildlife Federation during the first week of Spring, it is proposed that all Scout meetings emphasize the conservation program. This will call for the assistance of much man power outside the present available leadership. To supply this guidance the Scouts must look to State and Federal agencies interested in conservation matters, to informed members of sportsmen's groups, to service clubs, to ministers, to any organizations of men or women who have evolved a sound conservation philosophy and are willing to be joined by equally willing Scouts to do something to improve the national heritage.

Organizations that have spent years in passing resolutions about conservation, passing laws to insure conservation and passing the buck to others to do something about conservation, will, next March, have the chance to do something to help some three million Scouts implement the conservation idea. If you have a talent that may help in the conservation movement make it known to your local Scout group, if they do not know it already. If you are asked to help on a program in March remember that you will be taking part in a coast-to-coast effort to make this land a better place in which to live. If you have facilities that will help the Scouts do what they want to do in this matter, give them the help you can. If you are on the program committee of a service club, a parent-teacher group, a women's club, or any similar organization, either in March or before, give this effort on the part of the Scouts to help conservation, your blessing and your support. Let the Wildlife Week program this year be something of which we can all be proud.

The program itself should, if possible, suggest things the Scouts can do to advance conservation locally, at least between March and October, 1954. This does not mean just whooper-up pep talks and rallies, but something concrete that improves the environment in which you and the Scouts live. We can have urban activities that are definitely of a conservation nature if they lead to a wiser use of fuel, food, clothes and property in general, and if they enlist a more intelligent human effort to make things better generally.

To help implement this program it is hoped that there will be made available from various sources, at cost, simple units of activity suitable to the whole program. The United States Forest Service is supplying posters pertinent to the conservation of forests. Other activities definitely integrated with the effort are being organized in the Soil Conservation Service, the Fish and Wildlife Service, and in similar organizations. The National

Wildlife Federation of Washington, D. C., is publishing a series of guides suggesting specific things to do and how to do them, and the Boy Scout headquarters in New York is preparing special printed material to help in this effort. The Izaak Walton League of America plans to lend its assistance to making this project a success, and other organizations are cooperating.

The School Page of *Nature Magazine*, two months hence, will give its support to this effort by outlining more specific things to do than can be given here.

Following the special "kick-off" program of Wildlife Week in March, the Scouts of the country, we hope, will do many things to improve conditions for wildlife and to help the conservation of natural and human resources. We definitely hope that the sites of camps owned by scouting organizations will be managed better for wildlife than they now are. We hope that the Scouts may be allowed to work with sportsmen's groups in their efforts to improve woodlands and fields, to control flood water, reduce pollution, prevent and control fires and otherwise help things generally. This may call for serious planning in some cases, but Scout headquarters in New York has material available showing how such improvements have been effected in various parts of the country, and Dr. John Bulger of the National Wildlife Federation is making available many of the suggestions he got from visiting wildlife management stations from coast to coast. These will be illustrated by actual photographs of places, before and after the improvements have been made, with working plans showing how the changes were made, and tally sheets showing what materials and manpower are likely to be needed to do the jobs. In addition, there will be suggestions to ministers, teachers, service clubs and others as to how these ideas may best be presented.

It is hoped that a dynamic nucleus for making this whole idea "click" may be found in the 28,000 Boy Scouts among the 43,000 Jamboree Scouts who took part in the conservation program in California last summer. Almost to a man the adults who helped in that program are helping in this new one, which has the backing of President Eisenhower. If there are any of these boys in your vicinity, and you are interested in this program, get them to show the printed material with which they were supplied and possibly to tell you about what was done on those rolling, dusty, California hills last July.

The philosophy that habitat improvement is likely to be more successful than wild animal husbandry in helping wildlife conservation must please the general naturalist, as well as sportsmen, and it is towards the support of this philosophy that the wildlife effort in this program will be directed. Practically all States have evolved reasonably sound recommendations as to what should be done, and these should be sought from the local authorities, of course.

Following the initial steps already outlined, the Good Turn Conservation Program for 1954 will be brought to another focus in October, 1954. During one week of that month it is hoped that all Scout troops in the country will join in a national conservation Pow-wow. At this time a review of accomplishments made since the March kick-off will be emphasized. Awards of a nature suitable to the accomplishments will be made, and it is hoped that the Scouts will rededicate their efforts to the conservation cause.

As is true in every effort of this sort, there will be individuals who, because of minor differences, will feel that they should not join in this effort. I know one teacher who once saw a group of Scouts playing ball with the eggs they had just stolen from the first Canada goose nest to be found in their region in years. But while a few boys engaged in this ridiculous bit of destruction, thousands of others were making real effort to help. The Scouts have done much to eliminate prejudices due to religion, race and economic success. They are in a position to do much to help those of us who believe in conservation. Obviously they can do a better job if we give them every possible support, particularly during the period in 1954 to which they are dedicating themselves to conservation. To help them effectively it behooves each of us immediately to contact our local Scout organization and find the place in which we can best do a good turn in appreciation of the many good turns Scouts the country over have done for nearly a half-century.

NOW READY! A new educational program for the whole family...sponsored by **THE NATIONAL AUDUBON SOCIETY**



In summer, the snowshoe rabbit is the same color as his tundra home. But when snow comes he begins to turn white—and soon he's camouflaged again!



Here are two unusual "look-alikes". One is the owl—and the other, the spectacular Calico Butterfly which often alights *upside down* with his "owl-eyes" showing! Nature "protects her own" with fascinating camouflage!



What will these unusual creatures grow up to be? You'd never guess!

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RIGHT NOW is an excellent time for you to find out about the National Audubon Society's revolutionary "Museum-at-Home" program. Mail the coupon below and you may have **ABSOLUTELY FREE OF CHARGE** the current set, CAMOUFLAGE IN NATURE, including thirty fascinating natural color prints plus an informative album in which to mount them. (Value \$1.00) This generous **FREE** gift will demonstrate to you and your family how much pleasure and knowledge can be derived from this new plan.

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There is no subject more fascinating for young and old than Nature. How satisfying it would be if you could learn its mysteries in the personal company of friendly naturalists, such as those on the Staff of the National Audubon Society!

These scientists would show you how cleverly Nature "protects her own" with camouflage...explain the strange ways in which some animals reproduce, and rear their young. *Best of all, they*

would open your eyes to the wonders in your own back yard or park!

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The "Museum-at-Home" plan was developed to bring to your home the closest possible equivalent to this kind of *thrilling personal guidance*. Each month a fascinating new topic is selected, and you and your family explore it together with the National Audubon Society's experts. For each topic, a collection of about thirty natural color prints—usually brilliant true color photographs—is issued, together with an album in which the prints (already gummed for this purpose) may be mounted. An interesting fact-filled text explains your "Museum-at-Home" exhibits. And the total cost is very low; only \$1 for each set, plus a few pennies for shipping.

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How many moths and butterflies here?



ALL PICTURES IN THRILLING NATURAL COLORS!

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You assume no obligation when you send the Enrollment Coupon at the right, and receive your **FREE** CAMOUFLAGE IN NATURE set. You may resign your enrollment at any time you wish. But we feel sure that once your family has become acquainted with the "Museum-at-Home" plan, you will want to continue these delightful monthly "visits" for a while. That's entirely up to you, of course. However, we urge you to send the coupon **NOW** to be sure to get your first set **FREE**—and without obligation. Quantities are limited. Please mail the coupon without delay.

NATURE PROGRAM

Dept. NM 2 Garden City, N.Y.

Please send me **FREE** the CAMOUFLAGE IN NATURE series including 30 natural color prints, and an album to mount them in, plus informative text. Enroll me in the Museum-at-Home plan and send me the subsequent series as they are issued. I understand that you plan to issue one series each month, in cooperation with the National Audubon Society, for which I need pay only \$1.00 plus a small charge for shipping. I may cancel my subscription any time I wish without further obligation.

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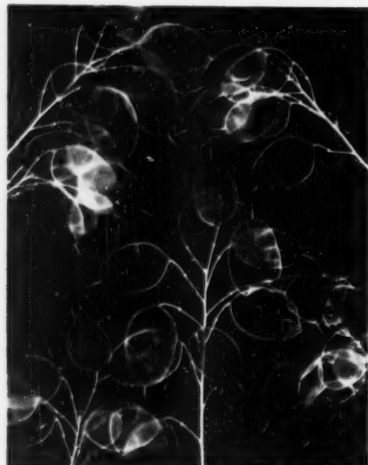
Mention NATURE MAGAZINE when answering advertisements

Camera Trails

By
EDNA HOFFMAN EVANS

WE HAVE not had an indoor "Camera Trails" section for some time and so one seems to be in order since this is the time of year when outdoor photographic activity is at a rather low ebb. February outdoor photography in warmer regions is all very fine, but there are places in other parts of the country where the photographer might as well stay inside for another month or two.

With the comfort of those colder clime dwellers in mind, I have been casting about for some interesting indoor photographic activity for the month of February. Thus, I was more than pleased to receive from the Eastman Kodak Company a sheaf of how-to-do-it material on a camera hobby called



Seed pods also produce interesting results when arranged as these are to make photograms.

"Fun With Photograms." The process was rather completely described by Eastman staff writer John Fish, and I am going to lean heavily on his report as I relay the information on to you.

As Mr. Fish describes them, photograms are really shadow pictures that anyone can make, and they can be made without using either a camera or a darkroom in the process.

Actually, as Mr. Fish points out, photograms are one of the oldest known forms of photography. He says that the earliest ones, made more than a hundred years ago, were the first pictures ever made with light. The word "photogram," itself, is an old one that was once used to mean the same thing as "photograph." It also has a more modern meaning, being defined as "a record obtained automatically by telegraph and re-

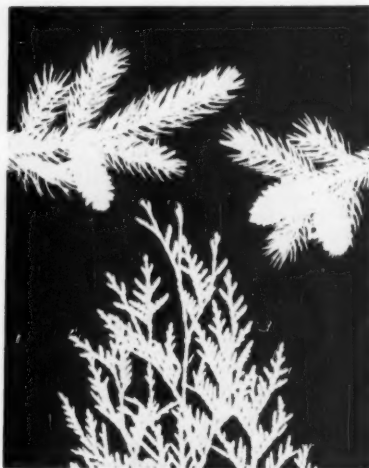


Flowers with translucent petals will produce photograms with an X-ray-like quality.

corded photographically." Today, despite our tremendous advances in camera and photo-developing techniques, the old style photograms still represent an easy means of producing attractive and decorative pictures that can be used in a variety of ways.

To make photograms (old style), all you need are a few simple supplies and a light source. An enlarger, with its easily controlled light, is best. But, lacking that—as many amateur photographers do—a bridge lamp, a gooseneck lamp, or even the room lights, can be used to expose the sensitized paper. Lacking a photographic darkroom, you can work quite successfully in a kitchen, bathroom, or any other place that can be darkened for the safe handling of photographic papers.

Supplies needed are an inexpensive safe-light, photo paper (an enlarging variety is best), plus developer, short stop, and fixer to use in processing the paper. Add to these a sheet of glass whose edges have been taped to prevent cuts, and you have all the



Evergreen sprigs give sharply contrasting designs of black and white.

equipment you will need for an evening of photogram production. All, that is, except for your subjects. To supply these you must use your imagination, artistic taste, and ingenuity.

Even in February, Nature will provide many interesting subjects. Evergreen branches from pine, cedar, spruce, or arborvitae, leaves if you can find them, twigs, seed pods, fern or other leaves from indoor planters, flowers if you have any—these all are possibilities.

Summon your artistic skill as you arrange these subjects to form photogram designs; try a number of combinations before you decide on any one definitely. You will do the arranging, of course, by means of the dim illumination of your safe light. Any other would promptly fog your sensitized paper. To people who have never



Heads of grain give a pleasing contrast of heavy masses and thin lines.

worked in a darkroom, this may sound like a difficult task, but, once your eyes become accustomed to it, you will be surprised at just how well you can see by the dim red or yellow glow from your safelight.

When you have decided on a satisfactory arrangement of your subjects, place them as you wish them to be on the sensitized paper. This paper, of course, should be laid, emulsion side up, on a flat surface. In case you are not sure which is the emulsion side, your fingers will be able to detect a slick side and a not so slick side. It is the emulsion that provides the slickness. Remember, the paper should be slick side up, but try not to handle it too much, unless, of course, you want to make an interesting collection of your own finger-prints.

Place the sheet of glass over your subjects so that they will be held in close contact with the paper. Then, when everything is set, turn on the white light for a few seconds in such a way that it casts strong shadows from your subjects onto the paper.

Consider your first few exposures in the nature of experiments, for you will have to determine by trial and error how long to leave the light on in order to get the best



This photogram design of falling leaves tells a story of autumn

results with your own particular equipment. Each print should be developed, rinsed, fixed, and washed according to the instructions for good processing that are printed on the packet from which the chemicals originally came. If you want still more help or advice in making photograms, write to Sales Service Division, Eastman Kodak Company, 343 State Street, Rochester, New York, and ask for the free booklet "Photograms—How to Make Them."

Do not be disappointed if the first few photograms are not exactly what you expected. Keep on trying. Before long you will notice how differently the light affects various subjects. Some, like the pine needles and other evergreen sprigs, will give you a sharply defined, two-tone contrast of black and white. Others that are more translucent will produce photograms with an X-ray-like quality. Contrasts of heavy masses and thin, threadlike lines, such as are given by the bearded heads of wheat or other grain, also prove interesting and satisfying.

For further variation, try telling a story with your arrangements. Place your leaves on the paper so that their design will suggest the way in which they drift to the ground in autumn. And, speaking of patterns, would it not be nice if the snow flakes and frost patterns would linger under the lights long enough for you to make photograms of them? Perhaps you can think of a way to imitate them in other, more lasting media.

While you can find an almost endless variety of photogram subjects in Nature, you need not limit your subjects to natural ones. There are photogram possibilities in kitchen gadgets, buttons, thread, paper clips, lace, tools, and other items you can find around the house. It is best to use simple designs at first, but once you have mastered the technique you can branch out, go modernistic, make caricatures, or whatever your fancy dictates. Making photograms is a pleasant and an entertain-

ing way to spend a February evening indoors.

MISCELLANEA—Travel folders are always fun to look at, and I was both interested and intrigued by two folders that I received recently, one painting the charms of Mexico and the other the delights of Hawaii. They were Lens Tours, "designed by photographers to suit the specialized interests of photographers." It is such a good idea that I am sorry I did not think of it myself.

The tours, according to their generously illustrated advertising pamphlets, "take you off the beaten paths of tourist travel, in constant quest of 'human interest' and scenic photographs that have not been worn threadbare by 'over exposure.' Our goal is the 'salon shot,' not the 'post card view.'" Further, the pamphlets point out, "the tours offer you a premium of good fellowship, the result of daily association



The Pell-i-can oiler makes a novel gift.

with others who appreciate and share your interests" as well as "a premium in photographic instruction and advice, available if desired, from the veteran pictorialists who conduct the tours."

Nor are Mexican or Hawaiian tours the only ones for photographers. Lens Tours for 1954 are also scheduled to scenic points in the American Southwest (the pamphlet calls it Navajo-land), to Europe, to South America, and even on a 65-day around-the-world jaunt by air. If you are interested and want folders of your own, write Travelworld's Thru the Lens Vacation Tours, 5814 Wilshire Blvd., Los Angeles 36, Calif., Eric L. Ergenbright, manager, for further information.

If you are having storage difficulties with your 35mm slides, you might be interested in the Mico-File, a clear plastic dispenser file that holds up to 60 readymounts and utilizes gravity to feed the slides, one at a time, through the guard slot. Each file also has a set of index guides to divide groups of slides. Available in most camera shops, a single file sells for \$1.00, or a set of six, in a covered library chest, costs \$5.95. The manufacturers, Mico Products Co., 119 South Dearborn Street, Dept. GCF, Chicago 3, Ill., will be glad to send you a descriptive folder, which also shows other products like the Mico-Vue and Mico-Ette viewers and other Mico-Lite attachments.

ATTRACT WILD BIRDS TO YOUR GARDEN WITH OUR PATENTED AUTOMATIC FEEDERS



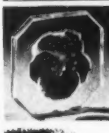
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HOW TO AVOID CRIPPLING DEFORMITIES

An amazing newly enlarged 44-page book entitled "Rheumatism" will be sent free to anyone who will write for it.

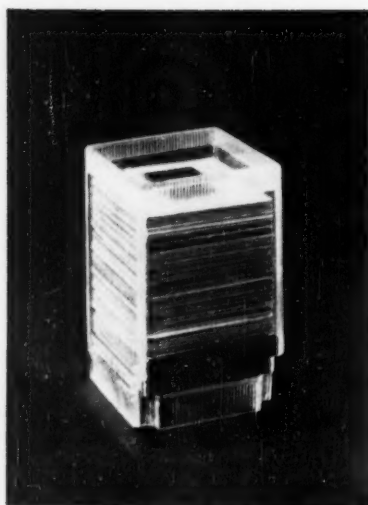
It reveals why drugs and medicines give only temporary relief and fail to remove the causes of the trouble; explains a specialized non-surgical, non-medical treatment which has proven successful for the past 35 years.

You incur no obligation in sending for this instructive book. It may be the means of saving you years of untold misery. Write today to The Ball Clinic, Dept. 543, Excelsior Springs, Missouri.

THE TEN-YEAR INDEX
(Volumes One to Twenty)

makes Nature Magazine a textbook. Order yours now . . . 50¢

AMERICAN NATURE ASSOCIATION
1214 Sixteenth St., Washington 6, D. C.



The Mico-File made of clear plastic will store as many as 60 35mm slides.

A novel gift for anyone with a movie camera, projector, tape recorder, or other equipment with moving parts is the Pelli-can oiler. This little gadget looks like a cross between a fountain pen and a hypodermic syringe and is, actually, a tiny oil can. It is ideal for getting needed lubrication into hard-to-reach places. You can get it, postpaid, for \$1.49 from Lofthouse Company, Box. 832, Binghamton, N. Y.

A boon to darkroom dabblers is Vividol, Ansco's universal developer designed for use with both films and papers. Because of this feature, it is necessary to mix only one preparation, not two, as usually has been the case, for a double job of developing and printing. The chemical is now being sold as a single-mix developer in a new foil-sealed packet for 12 cents each, or three packets for 35 cents. Each packet of single-mix Vividol will yield 16 ounces of stock solution, enough for six rolls of 120 film or for 100 $2\frac{1}{2}$ x $3\frac{1}{2}$ prints.

Finally, if you have some good black-and-white pictures or color transparencies that you would like to sell, Ansco is in the market for some to use in its advertising. The pictures should feature people, especially young people, should have action, human interest, and strong poster value. Negative size for black-and-white should be $2\frac{1}{4}$ x $2\frac{1}{4}$ or larger; color transparencies should not be smaller than $2\frac{1}{4}$ x $2\frac{1}{4}$. All pictures must be made on Ansco film. For further information, write to the Advertising Department, Ansco, Binghamton, N. Y.

Fishing Grant

Graduate fellowships to support research projects in fisheries management will be provided by using part of a grant of \$10,000 made to the National Wildlife Federation by the Outdoor Boating Club of America. This grant is to cover projects to make better fishing for American fishermen.

JOHN CASSIN

(Continued from page 90)

Samuel Washington Woodhouse was later in the Army Medical Corps, and participated in some of the historic exploring expeditions. But let us return to the letter from Baird to Cassin, written in December 1853. "Many years have elapsed since Sam Woodhouse took me down to the little house ever so far off, to see a friend of his who had a fine collection of birds. I little thought that visit would lay the foundation of the warmest friendship I ever formed."

Men, especially such men as Baird, do not so write without meaning it, and we may safely leave Cassin's reputation to their appraisal. Despite minor flaws in personal relationships, his record was outstanding. It was attested by elections to numerous scientific societies and by dedications in the names of several birds, among them the beautiful western purple finch, named for him by Baird. Cassin died January 10, 1869, cut down, as Brewer said, "in the full prime and vigor of life and in the very midst of his transcendent usefulness."

Wildlife Week

Wildlife Week in 1954 will be observed from March 21 to 27, and pollution control will be the central theme. The week is sponsored by the National Wildlife Federation. Charles H. Callison, conservation director of the Federation, states that the objectives of his organization with respect to pollution are six-fold. These are promotion of adequate anti-pollution laws in every State; adequate appropriations for State pollution control agencies; adequate sewage treatment facilities in every community; adequate waste prevention or waste treatment by every industry; prevention of silt pollution through soil conservation practices; adequate appropriations for research and cooperative programs by the U. S. Public Health Service.

Products

Eagle Manufacturing Co., Wellsburg, West Virginia, announces an all-purpose utility gasoline filler can for use with outboard motors, gasoline power lawn mowers and power-driven garden and farm implements. It is called Eagle 2½-A. . . Goodmark, Inc., 21 East Second Street, Dayton 1, Ohio, produces simple but effective "Down Spout Gards" adjustable to fit all down spouts and keep out leaves. Sells for \$1.25 a set of four. . . "See-Thru" are plastic drawer cabinets that allow one to see what is inside. Ideal for specimens. Information from General Industrial Co., 5738 N. Elston Ave., Chicago 30, Illinois. . . Fred Arbogast Co., 313 W. Worth St., Akron 3, Ohio, announces two new weedless fly rod lures called "Fly Rod Hula Popper"

and "Fly Rod Hula Spinner." Cost 75 cents each. . . Maroth-Kennedy Corporation, 2 Oak Ridge St., Greenwich, Conn., has a transparent typewriter bail—that bar that holds the paper down—that costs \$4.98. . . Products Unlimited, Box 322, Fairfield, Conn., announces "Pocket-Cushion" that fits into the pocket but inflates into a cushion for many purposes. \$1.50.

Bulletins

Four attractive, illustrated booklets come to hand from the Department of Fisheries of Canada in Ottawa. They are entitled "Purse Seines to Lobster Pots," "Science in Fisheries," "Canada's Pacific Salmon," and "Harvest of the Waters". . . "Growing Trees in a Free Country" outlines the forest policy of forest industries in the United States, and is published by American Forest Products Industries, Inc., 1816 N. Street, N. W. Washington 6, D. C. . . "How Does the Tree Crop Grow?" uses the comic book technique to teach a tree farming lesson, and is accompanied by a correlative booklet with suggestions for teachers. Both are available from International Paper Company, Southern Kraft Division, Mobile 9, Alabama.

Personal Mention

Elwood L. Demmon of Asheville, North Carolina, Director of the Southeastern Forest Experiment Station, U. S. Forest Service, was elected for the two-year term of 1954-55 as President of the Society of American Foresters by a mail ballot of the members. DeWitt Nelson, Sacramento, California, Director of the California Department of Natural Resources, was chosen Vice-President. . . Frederick C. Lincoln, special assistant to the Director of the U. S. Fish and Wildlife Service, was recently honored by an honorary membership in Dansk Ornithologisk, Denmark's leading ornithological association. . . Arne J. Suonela has been appointed Assistant Director of the Fish and Wildlife Service.

Getting About Outdoors

Land and Water Trails. By Ellsworth Jaeger. New York. 1953. Macmillan. 227 pages. Illustrated by the author. \$2.95.

The author of this interesting and practical little book appears to have overlooked very little that might be of assistance to one's competence in and enjoyment of the outdoors. His chapters are entitled "Water Travel," "Saddle and Bridle," "Knots and Lashings," "Annoying and Dangerous Pests," "Wilderness Critters," "Critter Signs," and "Tomorrow's Wilderness." A most generous supply of simple and practical illustrations supplement the text. Dr. Jaeger is Curator of Education and Hayes Professor of Science at the Buffalo Museum of Science, and this is his seventh book in the field of outdoor craft and wisdom in the woods.

THE READER'S MARKET

A place where members of the American Nature Association and readers of Nature Magazine may find many interesting offerings or may advertise themselves, at low cost, for things wanted; things they have for Sale, for Trade, for Sale or Trade. This is an excellent forum for acquiring or disposing of such items as binoculars, books, cameras and photographic equipment, magazines, sports and outdoor equipment, etc.

AGENTS WANTED

BUY WHOLESALE—25,000 items—Catalog 25c. Matthews, 1474-Y5 Broadway, New York City 36.

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BEGINNING WRITERS. Get \$1 to \$20 checks daily writing simple children's stories, articles, poetry in your spare time. Experience unnecessary. Our instructions reveal how. Details free. W. Herman, 5927 Euclid, Cleveland 3, Ohio.

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BINOCULARS. Microscopes, Telescopes, amazing prices, free trial. Folder "Binocular Selecting" catalog free. Prentiss Importers, Mercury Bldg., West Los Angeles 25, Calif.

BINOCULARS, TELESCOPES—Optical Goods. Large selection. Sensible prices. Learn truth about binoculars. Coating debunked. Free 38th Anniversary Catalog. DuMaurier Co., 82C, Elmira, N. Y.

BALSCOPE SR. This Bausch & Lomb masterpiece with 20x-40x-60x-75x eyepieces plus *Shurhold* Mount. Like new. Bargain. C. Mowrey, 219 State, Elmira 8, N. Y.

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BIRDS

BIRD LIFE in glorious direct color. 2x2 projection slides from exclusive closeup color photographs—used by students, instructors, clubs. Twelve slides, \$5.00. Twenty-five, \$10.00. John Stemen, Goshen, Indiana.

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BOOKS ON BIRDS. Mammals, Reptiles, Trees, general nature subjects. Catalog sent on request. Pierce's, Winthrop, Iowa.

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PLANETS AS MORNING OR EVENING STARS

(Continued from page 101)

relative to the sun, as viewed from the earth from conjunction to conjunction, is quite different from what it is for an inner planet. Mercury or Venus can never be seen on the meridian at midnight, which is the time of opposition to the sun for the outer planet, when the earth lies directly between it and the sun. At time of conjunction the outer planet is on the far side of its orbit with respect to the earth, and the sun lies directly between the two bodies. The outer planet at that time is passing from the western evening sky to the eastern morning sky. It will be a morning star from conjunction to opposition, and from then on to the following date of conjunction with the sun it will be an evening star. At time of opposition it rises in the east as the sun sets in the west and sets in the west as the sun rises in the east, and is above the horizon all night. As long as an outer planet is a morning star it is above the horizon at sunrise, although it may rise finally in the east in the early evening at some time after sunset, and be near the western horizon at sunrise. The outer planet is an evening star if it is above the horizon when the sun sets. Unlike an inner planet, the outer planet does not go through all the phases of the moon. Viewed through the telescope the disk of an outer planet is usually fully illuminated, except that for the nearer ones the disk may appear quite gibbous at or near the time of quadrature, when it is 90 degrees or so west or east of the sun. Under such conditions Mars is noticeably gibbous in appearance.

In practice one is apt to speak of an outer planet as a morning star or an evening star only if it is one of three planets—Mars, Jupiter or Saturn—and quite conspicuous in the eastern morning sky or western evening sky at the time it is observed.

In February Mercury will be at greatest eastern elongation on February 13, and may be seen in the evening twilight around that time. Venus has now passed into the evening sky, but will be too close to the sun to be visible in the evening twilight until near the end of the month. Mars is now a conspicuous object in the southeast before sunrise and might be referred to as a morning star. It passes from Libra into Scorpio in February. It is increasing in brightness and approaching the earth. Jupiter might be called an evening star this month, for it is high in the eastern sky in Taurus at sunset. It is the most brilliant stellar object visible until Venus comes into view above the western horizon. Saturn is in Libra and rises now before midnight and is west of the meridian at sunrise so would be defined as a morning star this month.

"OLD 1844", THE HOPE VALLEY TURTLE

(Continued from page 74)

one of the several paths that traversed the wooded lot. It was on such wandering that Billy had encountered and eagerly gathered up his turtle.

Mr. Kenyon and Mrs. Johnson had both suggested that we talk to Daniel James, the elderly caretaker of one of the two cemeteries of Hope Valley and a man with a long memory for local history. Mr. James had gone to Boston for the day, but this disappointment was offset by the excellent memory of another aged inhabitant of this pleasant wooded valley.

Without Dan James to guide us through the large cemetery, we decided that the best way to check the tombstones was to separate, each taking a different sector. We were just examining the first grave markers when Mrs. Johnson saw a man moving slowly about at the far end of the largest area. She walked down to see who it was, and whether or not he could be of help to us in our search. In the meantime we started our check of the markers, which bore dates back to 1700. The late July afternoon sun made our task seem more arduous than it was, but the hope of success hastened our steps.

Our search was interrupted by Mrs. Johnson's urgent call. Her excited tone left no doubt that she had come upon a clue of importance. She was engaged in animated conversation with an elderly man, whose tanned and lined face gave evidence of his long years in sun and wind. His white mustache quivered slightly in the faint breeze, and his face had an air of gentle repose, which was in direct contrast to the alert expressiveness of his keen eyes. He leaned heavily on his wooden walking stick, his gnarled hands grasping the end for support. This was Samuel Reynolds who had spent all his 85 years in and near Hope Valley. Dressed in neat overalls, spotless blue work shirt and green-visored straw hat, it was he who led us to our final clue.

We asked him if he knew anyone whose initials were E B K.

"Why, yes, that'd be Eddy Kenyon."

"Was his middle initial B?" The old gentleman nodded:

"His name was Edward Barber Kenyon, and he's buried right over there."

He led us slowly to the grave of Edward Barber Kenyon, bearing a simple headstone marked E B K. From the main family stone we learned that Kenyon was born in 1825 and that he died in 1900. Thus Edward Barber Kenyon was nineteen at the time the turtle was supposedly marked—a good age for marking a turtle. Mr. Reynolds told us that Eddy Kenyon lived on a farm about a half-mile north of the farm where the turtle was found, and that Kenyon's uncle, Edward Barber, had owned the farm at that time. If the turtle had just attained its full shell growth when marked, it would have been

about the same age as young Kenyon. The two, pursuing different ways of life, would have grown old in the peaceful surroundings north of Hope Valley. Edward Barber Kenyon died at 75 and was buried in Woodrider Cemetery on Noose-neck Road, while two miles away the turtle "kept the noiseless tenor" of its way for at least 130 years.

Pleased, we talked to Samuel Reynolds about other pertinent but less important matters. He could name no one whose initials were G. V. B., but since the Barbers and Bitgoods were active in the turtle's home area it seemed likely that one of them had made the more recent carvings. I asked Mr. Reynolds if he had ever found a turtle that had been marked, or if he had ever marked one. He replied that he personally had not, but he did know of others doing so. He said that his uncle, John T. Reynolds, had marked one some years before he went off to the war, and that Mr. Reynolds' daughters had found it on the same farm just ten or fifteen years ago. Not being sure of the time element involved here, I asked him if he meant the Civil War. He looked up questioningly and after a moment said,

"I don't know what you'd rightly call it but it was the war with those southern folks."

He meditated for a while and said that the date on the turtle his uncle marked was 1851. We then asked him what date was put on when a turtle was marked. He seemed indignant to think that anyone would put on anything but the year that the turtle was found. After reminiscing with us for some time, Mr. Reynolds took leave of us with our grateful thanks echoing in his ears.

As we left the cemetery, John Rogers summed up our feelings when he said,

"Well, Jim, that seems to prove your old turtle's age beyond reasonable doubt."

Starting with the discovery of a five-year-old boy, we were ready to bring our efforts to a close through the help of an eighty-five year old gentleman. We had come about as close as can be done in verifying the age of a turtle living in the wild.

Dr. Carr, who is previously mentioned, says:

"The only reliable means of gaining an idea of how long turtles live is to live with them, and this course can become monotonous in extreme."

The Hope Valley turtle thus becomes one of the best authenticated box turtles on record. The earlier date carved on the shell, 1844, plus the estimated twenty years necessary for full shell growth, give the turtle a minimum age of 130 years. This extreme age makes this turtle one of the oldest known animals, exceeded in age only by the large land tortoises that are known to have lived as long as 152 and 177 years.

Today the Hope Valley turtle enjoys comfortable quarters at New York's Bronx Zoo, where daily he receives watchful care.

His migrations from Rhode Island blueberry patch to the metropolis of New York, thence to Florida and back to New York have ended, and he can devote himself to living to an even riper age than his estimated 130 years.

LETS TAKE A WALK

(Continued from page 78)

rapidly through certain alleys and tunnels. Sometimes even Nature is overly profligate with her perfume. I remember a hollow in Allegheny County through which a road dipped. The area was crowded with locust trees, and, in flowering time, the hollow became full to overflowing with the scent. To drive through was to be almost overwhelmed with the odor.

But for enjoying Nature's delicate and subtle perfumes, walking is necessary. The unmistakable odor of trailing arbutus; the licorice smell of sweet cicely; that nostalgic essence of an evergreen forest in the rain; the wondrous odor of ripening fruit. The even more prosaic aromas from a campfire seem heavenly after a long day in the open—odors of hot coffee, or frying bacon, or even onions. And the first whiff one gets of the ocean, or of clover or alfalfa drying in the sun, are unforgettable; when met again they are old and welcomed friends.

Take off your gloves when you walk. Feel the contours, the textures, the weight of things. Have you felt the velvety smoothness of the buds of a pussywillow, of the leaf of a buttonweed, or the "shingles" on a butterfly's wing? Can you determine the American from the slippery elm by the "feel" of the leaves alone? The feel of the fur of different animals is as amazingly unlike as is that of the overlapping feathers of birds. When we meet a little rubber boa or coral snake, I encourage the vikings to hold the animal. Instead of being slimy, as is commonly supposed, snakes seem silky to the touch.

Walks store up memories of things tasted. I always think of blueberry-covered mountains when someone mentions Maine, and of an old rail fence on a Ohio farm when I hear the word blackberries. Other places suggest themselves when dewberries, wild strawberries, walnut, hickory, hazel, bechnuts, clams, lobsters, or peppergrass are mentioned. Wheat!—Remember how you used to thresh out the grains from a brown head in your hand, blow away the chaff, and pop the plump kernels into your mouth for a satisfactory chew? I still cannot pass a timothy stalk without pulling out the head and chewing on the tender end. Remember the tree that bore the sweet black cherries, the one from which you pulled the red Astrachan or the yellow transparent apples?

So we think Joe Bennett has missed a lot. His everlasting riding has robbed him of many simple but satisfying pleasures. Our walking makes us healthy, wealthy in accumulated memories, and Nature-wise.

Southern Birds

An Album of Southern Birds. Photographs by Samuel A. Grimes. Text by Alexander Sprunt, Jr. Austin, Texas. 1953. University of Texas Press. Illustrated by 101 plates; four in color. \$8.75.

As the title indicates, this is primarily a book of pictures; beautiful pictures by a master of bird photography. Alexander Sprunt provides a biographical introduction to Mr. Grimes, an introduction that is primarily a picture of the photographer afield, and of his methods and achievements in avian photography. Also, Mr. Sprunt has provided brief captions, which are descriptive of the pictures but make no attempt to supply scientific ornithological data. This is a book for the joy of looking and admiring the skill of Sam Grimes, who is a professional engraver and who, no doubt, saw to it that the engravings would be of the highest standard. The color plates are of the American egret, Everglade kite, cardinal and Canada warbler.

Tahiti

Tahiti: Voyage through Paradise. By George T. Eggleston. New York. 1953. The Devin-Adair Company. 252 pages. Illustrated with 100 photographs by the author. \$6.00.

Tahiti and the Society Islands have been wreathed in romance and beauty in the writings and paintings by many eager lovers of and publicists for the region. Thus many people have wished to be able to do what the author of this book finally did—take a leave from editorial work and, with his wife, poke about in many out-of-the-way places in these Polynesian islands. It was a leisurely trip in a small boat, visiting places rarely seen by outlanders, coming to know the people and to share the enthusiasm of others who have found happiness in these island dots on the South Pacific map. Many readers will now be able to realize their ambition by proxy, enjoying Mr. Eggleston's fascinating trip with him and seeing his words come alive through the fine pictorial log that supplements the text.

Recordings

Songs of ten southern birds, recorded in the wild, are the latest addition to the bird records brought out by Comstock Publishing Associates, Ithaca, New York. The birds included on this record, which is entitled "Florida Bird Songs," are mockingbird, cardinal, Florida wren, bluejay, boat-tailed grackle, ivory-billed woodpecker, Florida sandhill crane, limpkin, barred owl and chuck-will's widow. They are reproduced on both sides of a ten-inch disc with commentary. The price is \$2.50. Cornell University Records also announces revision of its earlier album, "Voices of the Night." Calls of thirty-four frogs and toads of the United States and Canada are now available on a 12-inch, double-faced, vinylite record, 33-1/3 rpm, for \$6.75.

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UNDER THE MICROSCOPE

By JULIAN D. CORRINGTON

HOOKWORMS

Photomicrographs from slides courtesy Ward's Natural Science Establishment, Inc.

AMONG the multitudinous ills of mankind, the most important of those caused by worms is hookworm infection. The reading public today is more or less familiar with the story of this scourge in the southern United States. Hookworms and pellagra, a vitamin-deficiency disease, we learned as chiefly responsible for the indigency of the "poor whites" until, in the last quarter-century, philanthropy teamed with medicine, biology, and sociology to lick this vast problem and greatly reduce its casualties. The evils are still with us and in many parts of the world are as acute as ever, but the basic scientific puzzles have been solved, and complete eradication is now primarily a matter of applying what is known,—that is, of economics and government.

Central figures in this large-scaled co-operative study are the worms themselves, small creatures, indeed, to kick up such a hue and cry, and more often debilitating than fatal. There are two principal species that infest man: *Ancylostoma duodenale*, the European or Old World hookworm, and *Necator americanus*, the American or New World hookworm. These may at times be harbored by other animals, but are primarily human parasites.

In differentiating the species, the buccal capsule of the anterior end (mouth capsule) is inspected. As seen on prepared slides the mouth opening is toward the observer and the forward rim is the worm's ventral margin, since the anterior end of these worms curves somewhat dorsally. It is not this feature that was responsible for the name "hookworm," however; according to Stiles it was given because the fleshy rays that support the bursa of the male were thought to be hooks. The name is erroneous, but remains through long usage. This bursa is an expanded terminus of the body in the male only, readily serving to distinguish the sexes; moreover the males are one-fifth shorter in length than the females, quite apparent when the two are side by side.

Ancylostoma means "hook-mouth," referring to the teeth. These are two on each side of the ventral rim of the buccal capsule (anterior rim), conspicuous, hard, and sharp. They are not true teeth, in the vertebrate sense, but are pointed projections of a single plate of hard material on each side of the mouth and serve as grasping and piercing organs. In *Necator*, meaning "the killer," these plates are without projections and are designated cutting plates, the main and most evident pair being ventral. The pattern of rays



Female (larger) and male of European hookworm, *Ancylostoma duodenale*.



American hookworm, *Necator americanus*.

in the bursa of each species is likewise diagnostic. Necators are somewhat smaller and more slender than ancylostomes and their anterior ends are more decidedly curved. The female ancylostome has a caudal spine lacking in necators.

Hookworms are small nematodes—the class of roundworms to which they belong—and on the stout side. Specimens for study or mounting may be obtained through public health personnel or laboratories, but the similar species from dogs or cats, *Ancylostoma braziliense*, *A. caninum*, will serve just as well and are much easier to secure. Any veterinarian can assist. Hookworms are ideal in size for microslide mounts and the internal organs show up well, either with or without staining. Some technicians prefer unstained preparations with this group of worms; others use iodine, Mayer's paracarmine,

Mayer's hemalum, Grenacher's borax-carmin, or still other stains. The major difficulty lies in the dehydration, clearing, and mounting.

The cuticle of these worms is impermeable, and so air is apt to be trapped within the body during the steps of killing, fixing, and dehydrating. Looking at the finished slide held in the hand, such a worm appears dull and opaque yellowish; under the microscope, due to refraction, the air looks black. This is troublesome and is to be overcome by doing the dehydrating and clearing under a partial vacuum, or by performing the various steps very gradually and slowly, using dioxan or cellosolve. Tashmisan punctured the cuticle with a fine needle when the worms were in seventy percent alcohol; Wotton used glychrogel as a mountant; Becker & Boudabush recommend double mounting in celloidin and balsam. They imbedded the worms in celloidin and, when hardened, cut small blocks from the celloidin, each containing a worm, and mounted these in balsam. Double mounting in glycerin-jelly and balsam is also widely practiced. Worms are processed to glycerin-jelly and mounted on slides with a bit of this material, then, when hardened, surrounded with balsam, using cover-glass props.

To facilitate comparisons the buccal capsules may be cut off and mounted with the mouth opening upward and the male bursas cut off and spread. Thus a single slide can compare the mouth capsules of *Ancylostoma* and *Necator*, side by side, with the bursas of each forming a second row. If photographically reduced printed or types labels are included, the technician has a teaching or demonstration slide to be proud of. Do not forget to mount the labels upside down above the item for which intended in each case, and all specimens upside down too, as the images will be reversed.

Where and how does one acquire hookworm infection? The names "Old World" and "New World" for the two main species were thought for some time to indicate their geographical distribution, but it is now known that both originated in the Eastern Hemisphere. *Ancylostoma* is a temperate zone worm and *Necator* a tropical one. Very generally speaking, *Ancylostoma* occurs between latitudes 35 and 20 in the northern eastern hemisphere, and *Necator* from 20 north to 30 south latitudes in both hemispheres. *Necator* was brought to the new world by African slaves, and the travels of many kinds of people in modern times has confused original distinctions.

This type of parasite has no intermediate host, but even so the life cycle and wanderings are complex. Eggs produced by female worms are fertilized internally and bear thin shells. When passed from the host they are in an early cleavage stage, and rapidly develop into embryos and larvae if the eggs have fallen upon suitable soil; porous, shaded, moist soils are ideal, from the worm's point of view. There are two generations of larvae, only



Mouth of *Ancylostoma*, showing teeth.



Mouth of *Necator*, showing cutting plates.

the last being infective. These reach a length of 600 micra and, as described by Chandler, exhibit characteristic form, color, and movements by which an experienced parasitologist can distinguish the two species. They climb upward in the surface soil to the very limit of moisture and extend into the air, in search of a human foot, but retreat downward to escape direct exposure to the sun's heat. Moderate warmth and contact stimulate them, and should a human foot be applied to the soil harboring hookworm larvae, they burrow into the skin until they reach a blood or lymphatic vessel.

Once within the host's circulatory system, the larvae are passively carried until they come to lodge in the small capillaries of the lungs. Here they burrow out of the vessel into an air space and are passed upward by ciliary action to the throat and are then swallowed, certainly a circuitous route in order to reach the intestine. After

two molts and rapid growth the larvae become mature worms and adhere to the mucous membrane of the intestine, developing the permanent or adult buccal capsule with its teeth or cutting plates. The intestinal lining of the host is sucked and dissolved until bleeding from capillaries starts, whereupon the worm's esophagus pumps blood through its body. The parasites shift their attachment sites from time to time, the old places continuing to ooze blood for a while. Egg laying by female worms commences within a few weeks and the adults may live as long as five years, although the great majority are eliminated long before a span of this length.

It is evident that the danger sites with hookworm infection are two—the lungs and the small intestine. Punctures in these places open the way for bacterial or other infection. Anemia from loss of blood is a prominent result; the red cell count may fall from five million to two million, and two-thirds of the hemoglobin may be lost in severe cases. Consequences may include an extreme listlessness, which was formerly put down as laziness, it being assumed the individual could do something about his condition if he chose, but that he was "just no good." The abdomen protrudes, the muscles become flabby, the face pale and puffy, the eyes stare, the pulse is irregular and the heart

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shows palpitation, the skin is harsh, growth is stunted, and mentally the sufferer varies from dull and apathetic to a state of confusion, and even to melancholia or mania. Severe, untreated cases usually end in death from diarrhea or heart failure.

An important discovery in control of this disease was that the number of worms harbored is a major factor. This number may be counted or computed in several ways, but that which has proved most useful is to estimate the number of eggs per gram of feces as an index to the infection load. Another important finding is the need for bolstering the diet with iron. Unfortunately, people whose unsanitary habits predispose to hookworm infection are those who are in the lower economic brackets and whose menus are scanty in amount and variety and lacking in vitamins and minerals.

Diagnosis is simple and depends on finding hookworm eggs in the stool of the patient. Treatment consists in administration of one or more doses of an *anthelmintic*, as drugs to kill internal worm parasites are now called. Thymol and oil of chenopodium were two of the earlier *vermifuges* (older term), replaced by the safer carbon tetrachloride, familiar as a fire extinguisher and as a dry-cleaning medium. Today tetrachloroethylene and hexylresorcinol are the drugs of choice, being efficient and nontoxic.

Prevention is based on breaking the life cycle of the worm at some point. Three main lines of attack seek this end—treating the patient and supplementing his diet strikes at the adult worms and their reproduction; prevention of soil pollution and treatment of polluted soil aims a blow at the eggs and larvae; and prevention of contact between polluted soil and human skin tries to prevent the change over in the habits and environment of the worm from a free-living animal to those of an internal parasite. Each of these measures sounds sensible and practical, but they run into difficulties. One must remember the ignorance and age-old superstitions and habits of the type of people infected. It is one thing to preach about sanitary toilets and the wearing of shoes and another thing altogether to provide these to populations whose numbers run into millions and who are themselves economically impoverished. And even where such facilities can be furnished, getting the people to use them is still another formidable block. Nightsoil from human sources is an absolute necessity as a fertilizer in many parts of the world, and in such regions sanitary disposal is not possible. This, the easiest link of the chain to break in theory, is hence seen to be unbreakable in fact.

When larvae penetrate the skin they produce local irritation termed *ground itch*. Extreme itching occurs, and open, infected pustules may result, but usually these effects are transient. However, when species of hookworms not normally infesting man happen to attack his skin,

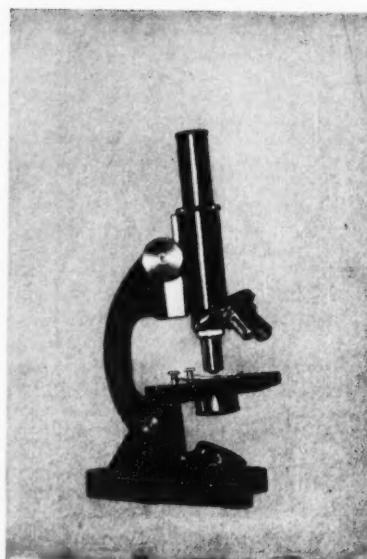
the larvae will wander about through the skin, traveling in the lower epidermal layer (*stratum germinativum*), but not going on into blood vessels. This causes an intense and painful itching known as *creeping eruption* which may be very serious and prolonged. Chief offender in the southeastern United States is *Ancylostoma braziliense*. Bathing beaches and children's sand boxes are especially liable to infestation by the larvae of this worm, and this is the real, underlying reason why dogs and cats must be excluded from beaches and other places where people habitually run and play barefooted.

PHASE-CONTRAST FOR THE AMATEUR

OUR first reaction on reading advertising material describing phase-contrast microscopes in the lower price brackets was one of scepticism. We had been indoctrinated with the notion that the materials, and especially the labor involved in manufacturing this type of equipment was necessarily expensive, and had come to accept the regrettable fact that these highly valuable instruments would continue in the five-hundred to one-thousand dollar scale. However, we were willing to be shown, and ordered a *Unitron* research phase-contrast model MPE, at \$265, and found it completely satisfactory. Being further intrigued by the seemingly-impossible claims of this organization for their \$99 model MPEA, we explored further and have been using this incredibly cheap instrument on cultures of living amoeba and paramecium, as well as on other materials, both fresh and stained.

The results have been remarkable. Living protozoa are seen as never possible by ordinary bright-field; cellular details, as trichocysts, cilia, gullet, membranelles, appear as clearly or more so than on stained slides, and are seen in action in the living animal. No one should expect this microscope to achieve the results of the elaborate thousand-dollar equipment produced by one of the major optical companies; but the image is definitely "phase," and very good.

An outstanding feature is the simplicity of operation—often complex in the more costly outfits. There is nothing to adjust or get out of order. The observer arranges his illumination, changes objectives, and focuses as usual; and that is all. The substage condenser is a fixed, single-lens unit equipped with a phase diaphragm; when this element is unscrewed the microscope may be used as an ordinary bright-field instrument. There are three objectives, 4X, P10X, and P40X, with eyepieces 8X and 15X; magnification range, 32X to 600X. The 4X objective is non-phase and, used with the substage diaphragm, gives a dark-field effect that is very satisfactory. Large numbers of paramecia, for example, may be seen swimming about in a mounted drop of culture, giving a better idea of their normal behavior than is usually obtained.



Unitron Phase Microscope. Model MPEA.

Focusing is performed by a coarse adjustment only. If a fine adjustment is wanted, there is an intermediate model, MPEB, at \$167, but we experienced little difficulty in securing a sharp focus without this aid. These microscopes are of Japanese manufacture, and are handsome in appearance and sturdy in construction. Four different phase contrasts are available: bright-high, bright-medium, bright-low, and dark-low. Of these, the bright-medium and dark-low are the ones of greatest interest and utility for all regulation work. Now, for the first time, this equipment, the most important development in light microscopy since oil-immersion objectives, is within the reach of the amateur, the high school, and the college freshman laboratory. For a discussion of phase-contrast microscopy and microscopes, see this Department for October, November, and December, 1951. For further information, descriptions, and prices of Unitron microscopes, write the United Scientific Co., 204-206 Milk St., Boston 9, Mass.

SONGS FOR ZOOLOGY PARAMECIUM

Pabst Blue Ribbon Commercial

When the lab assistant turns aside
To put some culture on your slide,
You place it on your microscope
And she says "Focus it, you dope!"
"Whad-de you have?"
"Paramecium!"
"What do you have?"
"Paramecium!"
"Whadde yuh have?"
"Paramecium!"
"Pair-a-mee-see-um!"
Woodruff, Sonneborn and Baitsell
Told us all about this great cell,
Hegner knew this ciliate well,
Para-mee-see-um.
(spoken) "Whad-de you have?"
(yell it) "PARAMECIUM!!!"

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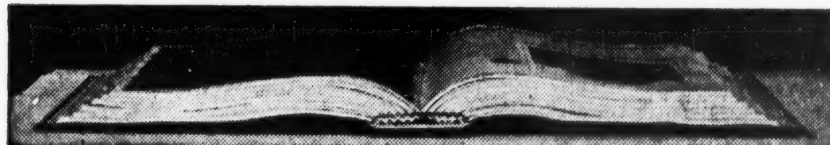
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tick . . . tick . . . tick . . .*

*And as you listened, those measured whispers of
time shut away the world, leaving you close to
Grandpa, secure in his love.*

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the lifeblood of happiness—security. The privilege of
providing it for those we love can be found only in a
land like ours.

And another wonderful thing is this: By realizing this
privilege of freedom for ourselves, we achieve the security
of our country. For, think—the strength of America is
simply the strength of one secure home touching that
of another.

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